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TRANSLATION

GROUP CONSTANTS FOR DESIGNING OF NUCLEAR REACTORS

By

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* ye initially, after vowels, and after ъ, ь; e elsewhere. When written as ё in Russian, transliterate as yё or ё. The use of diacritical marks is preferred, but such marks may be omitted when expediency dictates.

INTRODUCTION

At present, during designing of nuclear reactors and their radiation shielding multigroup methods of neutron calculation have found wide application.

During the last few years, there have been developed well both theory of such methods and also the technology of carrying out multigroup calculations on high-speed computers.

Detailed account of these questions can be found, for instance, in the books of Weinber and Wigner [1], Marchuk [2, 3], Galanin [4], and in other texts on the theory and methods of designing reactors.

Therefore, of important value is the composition of multigroup systems of constants characterizing interaction of neutrons with nuclei of the reactor and shielding materials.

At various times, various authors have published a large number of multigroup systems of constants [5-12].

However, in most cases, these systems embraced a very limited number of elements and were adjusted for the designing of separate, narrow classes of reactors.

Furthermore, one should note that, till now, systems of constants have aged comparatively, owing to the advent of new, more exact and more complete information about the elementary processes. Therefore, values of constants utilized in calculations must be periodically re-examined.

In this book are given multigroup systems of constants for fast and intermediate neutrons. During their composition, there was considered the experience of use of former systems of constants and new data on interaction of neutrons with nuclei.

Achievement of following aims was considered.

1. Increase of the number of enveloped elements and isotopes so that they would include, as far as possible, all basic reactor materials for which the composition of complete systems of constants has meaning. (Elements and isotopes for which it is possible to define only one capture cross section for the region of slow neutrons are not considered in this work.)

2. Subdivision of energy interval into a sufficiently large number of groups, ensuring the possibility of use of systems of constants for designing of reactors of different types. (Although, of course, previously-composed multigroup systems of constants always have a field of application.)

3. Carrying out of calculation of resonance structure of cross sections for the most important elements.

Although the basic content of this book is devoted to systems of constants themselves, in it are also considered certain methodical questions connected with their composition and use.

As was already noted, basic attention in book is allotted to constants for fast and intermediate neutrons.

Fast and intermediate neutrons play an important role in reactors of all types. In fast and intermediate reactors their role is determining. However, even in thermal reactors the processes of deceleration and propagation of fast and intermediate neutrons play a paramount role. Furthermore, fast and intermediate neutrons in considerable measure determine the properties of radiation shielding of reactors.

In the book are also given constant of the thermal group of neutrons — but only by means of assignment of values of cross sections on free and motionless atoms for neutrons with energy of 0.025 ev. Thereby, questions connected with composition of multigroup systems of constants for exact calculation of thermalization of neutrons exceed the bounds of this book.

During composition of systems of constants, there were used results of many works conducted both abroad and also in the Soviet Union: in particular, results of systemation of experimental and theoretical data on effective cross sections conducted by A. V. Malyshev, I. V. Gordeyev, and D. A. Kardashev; G. I. Toshinskiy and S. M. Zakharova; A. P. Suvorov, V. M. Sluchevskaya, and others; and methods of calculation of the resonance structure of cross sections, developed by V. V. Orlov, A. A. Luk'yanov, and F. F. Mikhaylus.

Group constants for hydrogen were composed by M. I. Lebedeva. Authors are greatful to Academician of Academy of Sciences of Ukrainian SSR, A. I. Leypunskiy, for constant attention to the work and for counsel.

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CHAPTER I

PRINCIPLES OF COMPOSITION AND USE OF MULTIGROUP SYSTEMS OF CONSTANTS

Definitions of Cyrillic Items in Order of Appearance

р = s = scattering з = d = deceleration
у = w = withdrawal св = bo = bond

§ 1. Survey of Group Constants

General Remarks

During the use of the multigroup method of designing reactor systems, the entire region of variation of energy (or lethargy) of neutrons is divided into a series of energy intervals. Neutrons whose energy lies in defined energy interval, are combined in one energy group.

Interaction of separate groups of neutrons with the medium is characterized by a set of group constants. It is necessary to distinguish two types of group constants which are intimately connected among themselves (and, in most cases, simply coincide); but, still, to avoid confusion, one should make a distinction between them.

Group constants of the first type determine propagation in space of neutrons of separate groups and transitions of neutrons between groups, but not the change of energy of neutrons within limits of separate group intervals. Group constants of this type can be used directly in the simplest "pure" variant of multigroup calculation, in which the change of energy of neutrons inside separate groups does not find direct reflection.

Group constants of the second type have the following meaning. During the carrying out of multigroup calculations, it is usually considered that effective cross sections and other nuclear-physical quantities characterizing interaction of monoenergetic neutrons with nuclei of the medium, within limits of energy intervals of separate groups do not depend on energy of the neutrons. In other words, true energy dependences of effective cross sections and other nuclear-physical quantities are replaced by step ("piecewise-constant") functions. Constant (within limits of separate group intervals) values of these functions we shall call group constants of the second type. These values are obtained by rational intragroup averaging of true functions. Therefore it is possible to say that group constants of the second type are average-group values of effective cross sections and other nuclear-physical quantities.

Group constants of the second type can be used in two ways.

First, by proceeding from them can there be determined group constants of the first type, which are then used in "pure" multigroup calculation.

Secondly, they can be used directly in certain variants of the multigroup method of calculation, in which the process of thermalization of neutrons inside group intervals of energy is also described (but, here, a simplifying assumption about the constancy of cross sections is made).

Let us consider, at first, more specifically group constants of the first type.

Group Constants of the First Type in General Case

With the framework of the "pure" multigroup approach, interaction of neutrons with the medium can be characterized by the following group constants (Peierls):

α_i — macroscopic collision cross section of neutrons of i-th group. It characterized attenuation of a "narrow" neutron beam of i-th group during passage through medium; $\beta_{i,k}(\theta)$ — macroscopic cross-section characterizing appearance of neutrons of k-th group on unit of path of neutron of i-th group (at angle θ to this path).

With the framework of group approximation, these constants completely* determine propagation of neutrons in the medium. However, they do not separate especially the process of production of neutrons during fission. In the practice of calculation the process of fission usually is considered as absorption, while production of neutrons during fission is considered separately as the presence of sources of neutrons.

In this case interaction of neutrons with the medium is characterized by the following, more detailed set of group constants (index of number of group, for brevity, subsequently is frequently omitted):

$\Sigma_s(\theta)$ — macroscopic scattering cross section, in which the neutron remains

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*In reality it is assumed here that scattering does not depend on azimuthal angle, and so forth.

within the limits of the group. In general, it depends on scattering angle; Σ_w – withdrawal cross section of neutrons from given group. It is composed of absorption cross section Σ_a and transition cross-section from given group to lower ones, called subsequently deceleration cross sections Σ_d:

$$\Sigma_y = \Sigma_a + \Sigma_s$$

(we shall limit ourselves here to cases when scattering does not lead to an increase of energy of neutrons).

Absorption cross section consists of capture cross section (without fission) and fission cross section:

$$\Sigma_a = \Sigma_c + \Sigma_f.$$

Deceleration cross section is composed of deceleration cross-section counting elastic and inelastic scattering:

$$\Sigma_s = \Sigma_{s\,(e)} + \Sigma_{s\,(in)}$$

$\Sigma_{d(i,k)}(\theta)$ – transition cross section from i-th group to k-th (owing to elastic and inelastic scattering). In general, it depends on scattering angle.

If inelastic scattering is accompanied by processes of type (n, 2n), then deceleration cross section will not be equal to sum of transition cross sections, i.e.,

$$\Sigma_{s,\,i} < \sum_k \Sigma_{s(i,\,k)}.$$

Sources of fission neutrons are determined by two additional parameters:

ν_i – average number of secondary neutrons during nuclear fission by neutrons of i-th group (for simplicity for now we consider that in medium there exists one fissionable isotope); ε_k – for k-th group in neutron fission spectrum.

The cited Peierl group constants are expressed through new constants in the following way:

$$\alpha_i = \overline{\Sigma_p(\theta)} + \Sigma_y,$$
$$\beta_{i,\,k}(\theta) = \Sigma_{s\,(i,\,k)}(\theta) + \Sigma_{f,\,i}\,\nu_i\,\varepsilon_k.$$

Averaging sign in first formula signifies averaging with respect to solid angle. Here and earlier it was assmued that cross sections depending on angle are normalized with respect to full solid angle.

Group Constants of the First Type in Transport Approximation

During solution of multigroup equations of neutron transfer various approximations are used, differing in accuracy of calculation of angular distribution of neutron scattering and angular distribution of neutron flux.

The most widely applied are the method of spherical harmonics (P_n-method), the Carlson method (S_n-method), and their combination.

In method of spherical harmonics there is used expansion of angular distributions of neutron scattering and neutron flux in series in spherical functions. Different approximations of given method differ in the number of preserved members of these expansions.

The simplest is the P_1-approximation, in which angular distribution of neutron scattering is characterized by one quantity — mean value of cosine of scattering angle $\overline{\mu}$.

It is necessary to note that during the designing of reactor systems, increase of accuracy of calculation of angular distribution of neutron flux usually is more important than increase of accuracy of calculation of angular distribution of neutron scattering.

Therefore, during the designing of reactors, there are widely applied approximations in which angular distribution of scattering gives only mean value of cosine of scattering angle (in other words, it is considered in P_1-approximation), although here the angular distribution of neutron flux, when necessary, can be considered more strictly (in higher P_n- or S_n-approximations, and so forth).

Systems of group constants given in this book are intended for calculations in just such approximations.

Let us consider first the propagation of one separate group of neutrons.

With the framework of the discussed approximations, angular distribution of scattering, leaving neutron in the considered group, is characterized by mean value of cosine of angle of this scattering $\overline{\mu}_{i,i}$.

In P_1-approximation angular distribution of scattering is reflected with an accuracy of two first members in exapnsion in spherical harmonics. In other words, true angular distribution (assigned in the form of function of scattering angle is replaced by the following:

$$\Sigma_p(\mu_{i,i}) = \Sigma_p(1 + 3\mu_{i,i}\bar{\mu}_{i,i}) \qquad (1)$$

(here, cross section is normalized with respect to full solid angle). From form of equations of neutron transfer in P_1-approximation, it follows that there possibly is another interpretation of this approximation. Namely, one may assume that in the P_1-approximation scattering with true angular distribution is replaced by scattering consisting of two parts: scattering with isotropic angular distribution and scattering not varying the direction of motion of the neutron (i.e., straight forward scattering). Cross-section of first part in equal to the so-called transport scattering cross section

$$\Sigma_{p,tr} = \Sigma_p(1 - \bar{\mu}_{l,l}). \qquad (2)$$

Thus, true angular distribution of scattering is replaced by the following:

$$\Sigma_p(\mu_{l,l}) = \Sigma_{p,tr} + \Sigma_p \bar{\mu}_{l,l} \delta(1 - \mu_{l,l}). \qquad (3)$$

It is known that in P_1-approximation angular distributions (1) and (3) lead to identical results. Since scattering not varying the direction of motion of neutron cannot be considered in examining of one group of neutrons, one may assume that in P_1-approximation true anisotropic scattering is replaced by isotropic with cross section equal to transport scattering cross section. Therefore, in examining in P_1-approximation of one group of neutrons, instead of assignment of $\bar{\mu}_{1,1}$ there can be used assignment of transport scattering cross section or full transport cross section, equal to

$$\Sigma_{tr} = \Sigma_{p,tr} + \Sigma_y.$$

Approximations based on the replacement of true angular distribtuion by distribution (3) (which in the examination of one group is equivalent to replacement of anisotropic scattering by isotropic with a cross section equal to transport cross section), usually are called transport approximations.

From that presented above it follows that transport P_1-approximation is equivalent to full P_1-approximation.

During the designing of reactors, there frequently are applied higher transport approximations also.

In these cases anisotropic scattering, as before, is replaced by the equivalent isotropic, but angular distribution of neutron flux is considered more exactly than in P_1-approximation. Although transport approximations higher than P_1 no longer are equivalent to the corresponding "full" approximations, their use in many cases permits considerable increase of accuracy of calculations. At the same time, for application of these approximations it is sufficient to assign the same group constants as for P_1 approximation.

It is necessary to note that other approximations using the same set of group constants are possible. For instance, in higher approximations of method of spherical harmonics it is possible to work from the calculation of angular distribution of scattering in form (1). In this case all members of expansion of angular distribution of scattering in spherical functions, besides the first two, are assumed equal to zero (while transport approximation, i.e., form (3), is obtained on the assumption that coefficients in high members are equal to second coefficient; thus, in approximations higher than P_1, forms (1) and (3) no longer are equivalent). The answer to the question of which of the two mentioned approaches is better depends on concrete peculiarities of the considered system. Usually it is preferable to use transport approximation. This is explained by the fact that for the majority of elements at high neutron energies, anisotropy of scattering is great and angular distribution of scattering has strong "diffractional" maximum at small angles, which is well distinguished in transport approximation. It corresponds to δ-type member of distribution (3).

At low energies, angular distribution of scattering more often corresponds to second approach. However, in this case the actual anisotropy usually is slight, and therefore both approaches give close results.

Let us consider now calculation of anisotropy of transitions between groups.

With the framework of the considered approximations, anisotropy of transitions between groups is characterized by mean values of cosines of angles of scattering $\overline{\mu}_{i,k}$, accompanied by transition of neutrons from i-th group to k-th.

For calculations in multigroup P_1-approximation it is sufficient to assign values of $\overline{\mu}_{i,k}$. If more exact calculation of angular distribution of neutron flux is necessary, it is possible to use the same two approaches that were mentioned in examining one group of neutrons. Here, angular distribution of scattering, corresponding to considered transition, is taken approximately as given by an expression analogous to (1) or (3). Approximations using expressions similar to expression (3) can be called multigroup transport approximations. However, in distinction from the one-group case, in examining of transitions between groups it is no longer allowed simply to reject member corresponding to scattering cross section without change of direction of motion of neutron. Therefore, in multigroup transport approximation assignment of scattering cross section (transition) and average cosine of scattering angle is no longer reduced to assignment of one quantity analogous to transport cross section of the one-group theory. However, instead of assignment of transition cross section and mean cosine of angle of transition it is possible to assign cross section of isotropic transition and transition cross section without change of direction of motion.

If $\Sigma_{0(i,k)}$ signifies cross section of isotropic transition; $\Sigma_{1(i,k)}$ – cross section of transition without change of direction, then

$$\Sigma_{0(i,k)} = \Sigma_{s(i,k)}(1 - \mu_{i,k}),$$
$$\Sigma_{1(i,k)} = \Sigma_{s(i,k)}(\mu_{i,k}),$$

where $\Sigma_{d(i,k)}$ – cross section transition between i-th and k-th groups.

Calculation of anisotropy of trnasitions between groups considerably complicates calculations, and for many cases it is not absolutely necessary.

Therefore, further simplifications are frequently used, allowing as approximately to reduce the problem with anisotropic transitions to problem with isotropic transitions (in P_1-approximation this leads to diffusion approximation). For this purpose it is possible to use several methods.

The first can be called the simple transport approximation with isotropic transitions. In this approximation there are used correct values of mean cosine of scattering angle, leaving neutron in group $\overline{\mu}_{i,i}$ (or correct value of $\Sigma_{s,tr}$), but transitions between groups are assumed isotropic (i.e., $\mu_{i,k} = 0$).

In this case propagation of every separate group of neutrons is described in transport approximation exactly, but during description of transitions, deviations from exact transport approximation are allowed.

Second method can be called corrected transport approximation with isotropic transitions. Here, transitions between groups are considered isotropic, but their anisotropy is considered in indirect manner. Namely, angular distribution of scattering, leaving neutron in the considered group, is artificially corrected in such a manner that the assumed angular distribution of total scattering coincides with the real one. It is necessary to note that such a method can be used not only with respect to transport approximation. With respect to transport approximation, this method is reduced to the use as a transport scattering cross section, leaving neutron in the considered group, of average-group value of transport cross section of full scattering. Thus, instead of correct value (1) the following is used

$$\Sigma'_{p,tr} = \Sigma_p - \Sigma_p \bar{\mu}_{l,l} - \sum_{k,k \neq l} \Sigma_{s(l,k)} \bar{\mu}_{l,k} = \Sigma_{p,tr} - \sum_{k,k \neq l} \Sigma_{s(l,k)} \bar{\mu}_{l,k}. \tag{4}$$

In this case there are allowed deviations from exact transport approximation during the study of propagation of every separate group of neutrons, but owing to this there can be attained high accuracy of multigroup calculation on the whole.

This method is most frequently used during calculation of anisotropy of transitions caused by elastic scattering. For heavy elements, for which loss of energy during elastic scattering is slight and elastic scattering causes transition to one neighboring lower group, such calculation of anisotropy of elastic neutrons turns out to be fully satisfactory. In these cases the considered method leads to certain errors (as compared to exact transport approximation) in description of space distribution of only those high groups of neutrons for which basic source of neutrons is direct fission, and not deceleration from higher groups.

During transition to lower groups, errors appearing through the assumption that transitions are isotropic are well compensated by the described correction of transport scattering cross section, leaving neutron in the group. Therefore accuracy of description of space distribution of neutrons of these groups turns out to be almost equivalent to the accuracy of full multigroup transport approximation.

For light elements these errors are increased, and calculation of anisotropy of elastic transitions in corrected transport approximation with isotropic transitions becomes less valid.

This pertains especially to hydrogen, for which considered approximation not only does not ensure accuracy, but (with not too-broad groups), in general, is devoid of simple physical meaning, inasmuch as in this case it is necessary to add negative values to transport scattering cross section (leaving neutron in group). Although formally it is possible to use it in this case also.

It is necessary to note that during calculation of anisotropy of transitions caused by inelastic scattering, the use of corrected transport approximation with isotropic transitions is scarcely justified. Inelastic scattering (just like elastic scattering in light elements) is accompanied by great loss of energy and, consequently, causes transitions of neutrons to several neighboring low groups.

Therefore errors peculiar to the considered approximation affect the description of space distribution of many groups of fast neutrons.

The mentioned compensation will take place only for those very low groups into which inelastically scattered neutrons do not directly fall, but it will be very inaccurate owing to the great difference in transport cross sections for far-distant groups. Therefore, if there is used a claculating program not allowing direct consideration of anisotropy of transitions, then for inelastic scattering it is expedient to limit calculation to simple transport approximation with isotropic transitions; all the more so because anisotropy of inelastic scattering is usually slight (it, basically, is connected with motion of the center of mass).

Systems of constants given in this book for elements with $A > 20$ assume application of multigroup transport approximation with isotropic transitions ("corrected" — with respect to calculation of anisotropy of elastic transitions and "simple" — with respect to calculation of anisotropy of transitions).

For elements with $A > 20$ it is possible to calculate anisotropy of transitions in P_1-approximation (including those in the framework of full multigroup transport approximation). For these elements the possibility also remains of the use of transport approximations with isotropic transitions (both simple and corrected).

Thus, with in the framework of multigroup transport approximation (and other close approximations) interaction of neutrons with medium can be characterized by the following set of group constants:

$$\Sigma_{p,i};\ \Sigma_{f,i};\ \Sigma_{c,i};\ \Sigma_{s(i,k)};\ \bar{\mu}_{i,k};\ \nu_i;\ e_k.$$

In transport approximation instead of $\Sigma_{s,i}$ and $\bar{\mu}_{i,i}$ there can be used $\Sigma_{s,tr,i}$ or $\Sigma_{tr,i}$.

In approximations considering transitions as isotropic definition of $\mu_{i,k} (i \neq k)$ is not required. (If in the medium there are several fissionable isotopes, then constants relating to fission have to be defined separately for every isotope.)

For the enumerated macroscopic group constants of the medium there are corresponding microscopic (i.e., referred to one atom) group constants of separate elements or isotopes:

$$\sigma_{p,i};\ \sigma_{f,i};\ \sigma_{c,i};\ \sigma_{s(i,k)};$$
$$\bar{\mu}_{i,k};\ \nu_i;\ e_k$$

(or in place of $\sigma_{s,i}$ and $\mu_{i,i}$, $\sigma_{s,tr,i}$ or $\sigma_{tr,i}$)

In certain cases in tables of group constants only constants of this type are given.

Advantage of such method of presentation of data lies in the fact that these data can be directly used during multigroup calculations.

But this method has deficiencies also, since it not infrequently hampers required correction of group constants of this type, connected with concrete peculiarites of considered systems. The latter mainly pertains to determination of deceleration cross section.

Group Constants of the Second Type

In connection with the noted circumstances it is desirable that in tables there be given not only group constants of the first type, but also certain group constants of the second type, i.e., average-group values of effective cross sections and other nuclear-physical quantities.

Here, one should consider that average-group values of certain quantities are themselves group constants of the first type, with any reasonable interpretation, for instance σ_f, σ_c, ν.

Average-group values of other quantities coincide group constants of the first type in certain approximations.

Such a situation occurs, for instance, with respect to average-group value of full transport cross section determined ad

$$\sigma_{tr} = \sigma_e(1 - \mu_e) + \sigma_{in}(1 - \mu_{in}) + \sigma_f + \sigma_c,$$

where σ_e and σ_{in} – cross sections of elastic and inelastic scattering σ_f and σ_c – fission and capture cross section; μ_e and μ_{in} – mean cosines of angles of elastic and inelastic scattering. (here and subsequently in symbols of mean values of cosines of angles of scattering the sign of averaging is omitted).

Average-group value of full transport cross section, in general, is not the transport cross section of given group of neutrons, but it coincides with it with in the framework of corrected transport approximation with isotropic transitions.

A typical example of a quantity whose average-group value is not a group constant of the first type is ξ – average increase of lethargy during elastic scattering.

This quantity is used during calculation of cross section of elastic deceleration, but is given in tables of group constants separately, in order to ensure possibility of correction of values of cross section of elastic deceleration, and for other purposes.

In conclusion in tables of only group constants of the first type is not fully rational, but, on the other hand, it is not rational to be limited to definition of only group constants of the second type, i.e., average-group values of effective cross sections and other nuclear-physical quantities. For instance, characteristics of inelastic scattering and anisotropy of transitions are difficult to present in such form. Therefore in tables of group constants there are given group constants both of the first and also of the second types and, furthermore, values of certain auxiliary coefficients necessary for calculation of effects connected with resonance structure of cross sections.

More detailed explanation of the meaning of quantities included in tables is given below. In § 7 is given a summary of rules for the use of tabular data.

§ 2. Selection of Energy Intervals of Groups

Selection of energy intervals of groups utilized in the given systems of group constants is based on the following qualitative considerations.

1. In the energy band below 100 kilo-electron-volts uniform arrangement (on lethargy scale) of boundaries of groups is used, since typical effective cross sections in the considered energy band are changed during transition from a given group to a neighboring one by an approximately identical number of times.

Increase of lethargy in group is taken as equal to $\Delta u = 0.77$, which corresponds to diversion of a decade on energy scale into three parts, equal in increase of lethargy. Use of a large number of narrower groups, in principle, permits increasing accuracy of calculations, but only in the case when initial data possess sufficient accuracy.

By taking this into account during selection of width of groups, it is possible to use the following criterion.

Averagings of effective cross sections from different possible intragroup spectra of neutrons must lead to scattering of quantities not exceeding possible errors in initial data on effective cross sections. For appraisal let us consider the typical case when cross section varies according to the 1/v law.

For this case averaging of cross section, for instance, from such comparatively strongly distinguished spectra as

$$n(E)\,dE \sim \frac{dE}{E} \text{ and } n(E)\,dE \sim dE,$$

with selected width of groups, leads to a distinction in mean values in all of 2%. This is considerably less than probable error in measurement of the majority of cross sections. For comparison it is possible to note that if width of groups had been selected twice larger, scattering of the indicated mean values would constitute 10%, which is undesirable.

Certainly, during calculations there can be encountered cases of sharper distinction in intragroup spectra. For instance, for an elastically-moderating medium with high capture the main part of neutrons will be concentrated at upper boundary of the group. In this case for a cross section varying according to the 1/v law the average-group value of the cross section will differ by approximately 20% from the result of averaging from the above-considered spectra. However, into this group will enter only a small fraction of the neutrons slowed down (the majority of neutrons will be absorbed in higher groups). Therefore, the indicated 20%-error in definition of cross section of this group will not have an important value. Calculation shows that if in the considered conditions 1% of the neutrons slowed down reaches the given group, the error in definition of the capture cross section of this group will be less than 10%.

The given considerations show that from the point of view of averaging of smoothly varying cross sections, the use of groups narrower than is customary at present is of doubtful justification.

Further increase of the number of groups might be justified by necessity of calculation of resonance structure of cross sections. However, for direct calculation of resonance structure of cross sections the number of groups have to be increased many times.

Carrying out of mass calculations with such a large number of groups already exceeds the bounds of possibilities of contemporary computer technology. Therefore, it is expedient to use them only during the solution of separate special problems. Small increase of groups (for instance, two to three times) in this respect, is for practical purposes useless.

2. For the energy band over 100 kilo-electron-volts, there have been adopted somewhat narrower (in lethargy) groups, so that it is possible to more exactly consider threshold reactions having here place (inelastic scattering, fission, and others). During selection of boundaries of groups in this energy band, there additionally was considered the desire to have as one of the boundaries the energy 1.4 Mev,

corresponding to the effective threshold of fission of U^{238}, and also the energy in the 6.5-Mev region, corresponding to thresholds of reactions of (n, 2n) and (n, nf) fissionable isotopes

3. During selection of width of groups, it was considered rational that for the majority of elements the width of groups exceed the maximum loss of energy during elastic scattering. In this case elastic deceleration leads to transition to one neighboring group.

With the accepted width of groups, the indicated condition is satisfied for all elements, except hydrogen, deuterium, helium, and lithium. For the last one this condition is not satisfied only in upper groups. But since in this case maximum loss of energy during elastic scattering only insignificantly exceeds the width of groups, it was taken approximately that elastic deceleration causes transition to one neighboring group.

In conclusion let us note that the group subdivision taken in the given systems of constants in certain cases can be unnecessarily detailed or too bulky for available computer technology. For instance, with in the contemporary level of computer technology for solution of multidimensional problems there usually is required the use of a smaller number of groups than is taken in the given systems of constants. In such cases the number of groups can be decreased by their unification and corresponding averaging of group constants of the united groups.

In these cases the initial multigroup system of constants is considered as definition of energy dependences of constants subjected to group averaging (in wider group intervals).

It is clear that in connection with increase of width of groups this averaging should be done by taking into account concrete peculiarities of considered reactor systems.

§ 3. Group Averaging of Macroscopic Cross Sections of the Medium

During the composition of multigroup systems of constants, of important value is the selection of rational methods of averaging effective cross sections from energy intervals of separate groups. Naturally, the urgency of this question decreases together with increase of the number of groups, when different methods of averaging lead, practically, to identical values.

As was noted, with the selected width of groups for smoothly varying cross sections, in most cases, just this situation occurs in practice. Nonetheless, in this case also it is expedient to use rational methods of averaging. However, principle attention should be allotted the averaging of resonance curve of cross sections.

It is necessary to note that selection of a rational method of averaging of cross sections during the composition of systems of constants intended for the designing of reactors of different types somewhat differs from selection of the method of averaging for multigroup designing of one certain reactor. In the last case the method of averaging is selected such that calculation leads to correct value of k_{eff} of the given reactor (or of other of its selected characteristics).

This requirement means that effective cross sections have to be averaged with weighing functions depending on space-energy flux distribution and importance of neutrons in the given reactor [3, 13].

In our case it is impossible to be guided by flux distribution (and all the more by importance) of neutrons in a certain reactor.

Instead of this, during averaging of cross sections it is expedient to be guided by certain "standard" form of spectrum of neutrons within separate groups.

This "standard" form need not necessarily correspond to some certain reactor, but should be such that averaging leads to the smallest possible errors for the majority of cases encountered in practice.

Naturally, the selected standard form of spectrum cannot convey the peculiarities connected with resonance structure of cross sections.

Therefore, standard form will not be an exact spectrum, but a specturm "smoothed" with respect to resonance peculiarites.

It is natural to replace the condition of preservation of k_{eff} (or another selected characteristic) of a certain reactor by the requirement that during replacement of true (depending on energy) cross sections by average-group values, there be preserved correct values of basic quantities characterizing propagation of every group of neutrons.

Such quantities may include, for instance, total flux of neutrons of a given group; total number of captures (of considered type) of neutrons of given group, and mean square of distance covered by a neutron of the given group from appearance to absorption (or to emergence from group).

As standard form of spectrum smoothed with respect to resonances for all groups, except the three upper, there was selected the form of the Fermi spectrum

$$\varphi_0(u) = \text{const},$$

where $\varphi_0(u)$ — standard spectrum.

Such selection is expedient (and usually is used), since in practice for this energy band there are encountered spectra distinguished from the Fermi in both directions.

However, for the three upper groups (with $E_n > 2.5$ Mev) such selection is inexpedient.

In this energy band for reactor spectra the neutron flux is usually stronger with increase of energies than for the Fermi spectrum. For definitiveness, in the three upper groups as standard form there was selected the form of fission spectrum. Such selection is the most successful for calculation of media with strong inelastic scattering. However, it is satisfactory even for elastically moderating media, (with utilized width of groups).

For convenience we shall introduce the following designations for averaging of quantities with respect to standard spectrum (within limits of the separate group):

$$\langle a\rangle = \frac{\int\limits_{u_1}^{u_2} a(u)\,\varphi_0(u)\,du}{\int\limits_{u_1}^{u_2} \varphi_0(u)du},$$

where u_1 and u_2 are upper and lower boundaries of the group.

From selection of standard form of spectrum it follows that for all groups, besides the three upper, this averaging is equivalent to simple averaging with respect to lethargy

$$\langle a\rangle = \frac{\int\limits_{u_1}^{u_2} a(u)\,du}{(u_1 - u_2)}.$$

If effective cross sections within limits of the considered group have a resonance character, then in spectrum of neutrons there appear peculiarities corrsponding to peculiarities in the curve of cross sections.

During calculation of this effect, we shall proceed from the following basic assumption (approximation).

We shall assume that the distinctions between exact form of spectrum and the smoothed standard are inversely proportional to full macroscopic cross section of the medium:

$$\varphi(u) \sim \varphi_0(u)\frac{1}{\Sigma_t(u)}. \tag{5}$$

Since for all groups, besides the three upper, standard spectrum is taken equal to the Fermi ($\varphi_0(u)$ = const), then in these cases the indicated assumption becomes equivalent to the simpler

$$\varphi(u) \sim \frac{1}{\Sigma_t(u)}. \tag{6}$$

Accepted form of spectrum occurs when in the considered energy band collisions density weakly depends on energy

$$\Sigma_t \cdot \varphi(u) \approx \text{const.} \tag{7}$$

Last relationship occurs if at least one of the following two conditions is satisfied.

In the entire considered energy band absorption cross section is much smaller than scattering cross section

$$\Sigma_a \ll \Sigma_t. \tag{8}$$

Regions were absorption cross section is great as compared to scattering cross section have width smaller than loss of energy during elastic scattering. Since width of the indicated regions coincides in order of magnitude with width of resonances, the considered condition signifies

$$\Gamma \ll \xi E, \tag{9}$$

where Γ — full width of resonances (taking into account Doppler broadening).

Possibility of use of the considered basic assumption during calculation of effects connected with resonance structure of cross sections can be proven by the following considerations.

If not one of conditions (8) and (9) for the considered group is satisfied in medium there will occur strong resonance absorption, and the probability of a neutron is avoidance of resonance capture during elastic deceleration within limits of the considered group will be slight. But in these cases, as a rule, probability that a neutron will avoid resonance capture during elastic deceleration within limits of several higher groups will also be slight.

In other words, the considered group will be reached only by a small fraction of the neutrons being slowed down. In these conditions a certain error in calculation of resonance effects for the considered group will not have serious significance.

Additionally it is possible to note that when in the considered region of medium there are satisfied conditions opposite to those of (8) and (9), the considered group can be reached by an appreciable quantity of neutrons only during deceleration in neighboring space regions of the medium with subsequent diffusion to the considered region.

But then assumption (5) will again be valid for the integrated spectrum of neutrons in the considered region of medium. Consequently, the assumption made in this case will also be in some measure justified.

Now we shall consider group averaging of separate cross sections (average-group values of cross sections will be noted by a line above the sign of cross sections)

Absorption Cross Section

All that will be said about group averaging of capture cross section in equal degree pertains also to averaging of the fission cross section.

So that replacement of capture cross section depending on energy by constant group value will preserve total number of captures of neutrons of a given group, it is necessary to satisfy the following evident condition:

$$\int_{u_1}^{u_2} \Sigma_c(u)\,\varphi(u)\,du = \overline{\Sigma}_c \int_{u_1}^{u_2} \varphi(u)\,du, \tag{10}$$

where $\Sigma_c(u)$ — macroscopic value of capture cross section.

Using condition (5) for neutrons specturm in the group and previously introduced designations for averaging of quantities with respect to standard spectrum, we obtain the following expression for average-group value of capture cross section:

$$\overline{\Sigma}_c = \frac{\int_{u_1}^{u_2} \Sigma_c(u)\,\varphi(u)\,du}{\int_{u_1}^{u_2} \varphi(u)\,du} = \frac{\left\langle \frac{\Sigma_c}{\Sigma_t} \right\rangle}{\left\langle \frac{1}{\Sigma_t} \right\rangle}, \tag{11}$$

where Σ_t — full macroscopic cross section of medium. Here will be analogous expression for group value of fission cross section (definite isotope):

$$\overline{\Sigma}_f = \frac{\left\langle \frac{\Sigma_f}{\Sigma_t} \right\rangle}{\left\langle \frac{1}{\Sigma_t} \right\rangle}.$$

It is possible to note that a similar expression should have been used for group averaging of inelastic scattering cross section (at least for that part of it connected with withdrawal from the considered group). However, inelastic scattering usually occurs in that region of energy where resonance effects are insignificant.

Therefore, during determination of group value of inelastic scattering cross section, we use simple averaging

$$\overline{\Sigma}_{in} = \langle \Sigma_{in} \rangle.$$

Transport Cross Section

Let us consider, at first, diffusion approximation (additionally disregarding loss of energy during elastic scattering and considering inelastic scattering to be isotropic).

In diffusion approximation full transport cross section of medium enters in neutron-transfer equation through coefficient of diffusion, which is proportional to transport length, i.e., is inversely proportional to value of transport cross section. Therefore averaging (integration of diffusion equation leads to the following condition for average-group value of transport cross section

$$\int_{u_1}^{u_2} \frac{1}{\Sigma_{tr}(u)} \varphi(u)\, du = \frac{1}{\overline{\Sigma}_{tr}} \int_{u_1}^{u_2} \varphi(u)\, du. \tag{12}$$

It is necessary to note that during derivation of this condition (by integration of diffusion equation) it is assumed that form of neutron spectrum of the considered group does not depend on spatial coordinates. But this is the usual assumption for any multigroup approximation. From condition (12) the following expression is obtained for group value of transport cross section:

$$\overline{\Sigma}_{tr} = \frac{\int_{u_1}^{u_2} \varphi(u)\, du}{\int_{u_1}^{u_2} \frac{1}{\Sigma_{tr}(u)} \varphi(u)\, du} = \frac{\left\langle \frac{1}{\Sigma_t} \right\rangle}{\left\langle \frac{1}{\Sigma_t \Sigma_{tr}} \right\rangle}. \tag{13}$$

In those more exact than diffusion type, in the transport approximations the method of averaging of transport cross section can differ from the method given by expression (13). For its selection it is necessary additionally to stipulate that precisely which characteristics of propagation of neutrons whose valves we want to preserve during averaging. It is possible to show that expression (13) in transport approximations more exact than diffusion types, preserve correct value of mean square of distance from place of appearance to place of absorption of a neutron of the given group (in an infinite medium).

This circumstance can serve as as argument in favor of the expediency of use of the average-group value of transport cross section obtained from expression (13) and during calculations in more exact transport approximations.

In general, one should note that selection of method of averaging of cross sections can be based on less strict equations of neutron transfer than subsequent multigroup calculation.

In order to use expression (13), it is necessary to know not only energy dependence of total cross section, but also detailed energy dependence of mean value of cosine of scattering angle. In particular, it is necessary to know how mean cosine of scattering angle is changed within limits of separate resonances, but this information in most cases is absent. Therefore it is necessary to take additional simplifying assumptions that energy dependence of mean cosine of angle of elastic scattering is smooth, i.e., does not have resonance peculiarities.

Guided by this assumption one can determine the average-group value of transport cross section in the following way.

By analogy with expression (13) average-group value of total cross section is determined

$$\overline{\Sigma}_t = \frac{\left\langle \frac{1}{\Sigma_t} \right\rangle}{\left\langle \frac{1}{\Sigma_t^2} \right\rangle}. \qquad (14)$$

Separately, by simple averaging, there is determined average-group value of mean cosine of angle during elastic scattering

$$\overline{\mu}_e = \langle \mu_e \rangle.$$

Here it is possible to use simple averaging, since we allowed that energy dependence μ does not have resonance peculiarities.

Based on thus obtained average-group values of total cross section and mean cosine of angle of elastic scattering, average-group value of full transport cross section is determined by the usual method:

$$\overline{\Sigma}_{tr} = [\overline{\Sigma}_t - (\overline{\Sigma}_{in} + \overline{\Sigma}_c + \overline{\Sigma}_f)](1 - \overline{\mu}_e) + (\overline{\Sigma}_{in} + \overline{\Sigma}_c + \overline{\Sigma}_f). \qquad (15)$$

Average-group values of cross sections of nonelastic possesses (capture, fission, and inelastic scattering) utilized in this expression have to be obtained with the help of earlier-considered averagings.

It is possible to replace expression (13) by the less strict expression (15), but this basically is a corollary of the fact that calculation of the resonance structure of cross-sections usually has important value for those groups for which anisotropy of scattering is slight.

In these conditions only selection of a rational method of averaging total cross section is of essential value and calculation of correlation of resonance peculiarities of total cross section and anisotropy of scattering has lesser value.

Cross Section of Elastic Scattering

First of all, let us note that one should distinguish two average-group values of cross section of elastic scattering.

The first should be used during determination of group value of transport cross section. It is the difference between average-group value of total cross section and the sum of average-group values of cross sections of the inelastic processes

$$\overline{\Sigma}_e = \overline{\Sigma}_t - (\overline{\Sigma}_c + \overline{\Sigma}_f + \overline{\Sigma}_{in}). \qquad (16)$$

The second should be used during determination of the moderating capability of the medium (cross section of elastic deceleration). Below we shall discuss determination of average-group value of cross section of elastic scattering by the second value.

During selection of a method of averaging, we shall proceed from description of elastic deceleration in age approximation.

For simplicity, we shall consider that in the considered group inelastic scattering and sources of neutrons are absent. Consequently, neutrons enter the considered group because of elastic deceleration from upper groups.

The probability that a neutron will not be absorbed during deceleration within limits of the considered group is (per Wigner):

$$P = \exp\left[-\int_{u_1}^{u_2} \frac{\Sigma_c}{\xi(\Sigma_e + \Sigma_c)}\, du\right]. \qquad (17)$$

We shall demand that this probability preserve the correct value during replacement of cross sections by average-group values.

For this the following condition should be satisfied

$$\int_{u_1}^{u_2} \frac{\Sigma_c}{\Sigma_e + \Sigma_c}\, du = \Delta u \frac{\overline{\Sigma}_c}{\overline{\Sigma}_e + \overline{\Sigma}_c}. \qquad (18)$$

(Here, we consider that ξ does not depend on energy.) Proceeding from equality (18) and using expression for Σ_c, we obtain

$$\overline{\Sigma}_t = \frac{\left\langle \frac{\Sigma_s}{\Sigma_t} \right\rangle}{\left\langle \frac{1}{\Sigma_t} \right\rangle}. \qquad (19)$$

It is possible to show that expression (19) preserves correct value of increase of age during elastic deceleration within limits of the considered group.

§ 4. Group Averaging of Effective Cross sections of Separate Elements

In preceding paragraphs we discussed methods of averaging of macroscopic cross sections of the medium. From that presented it is clear that with strict approach total macroscopic cross sections of the medium must be averaged, but not microscopic cross sections of separate elements or isotopes entering in composition of the medium. However, such strict approach excludes the possibility of use of previously-composed systems of group constants of separate elements or isotopes; since we want to exploit this possibility, it is necessary to make additional simplifying assumption that during averaging of cross sections of a certain element, the sum of total cross sections of all other elements entering in composition of the medium does not depend on energy of the neutrons (within limits of the considered group).

With such approach, in tables of group constants group values of cross sections of separate elements, as functions of the sum of total cross sections of all other elements entering in composition of the medium are given.

Basic deficiency of the considered approximation is that it does not consider effects connected with the possibility of coincidence (in energy) of resonance peculiarities of cross sections of different elements, but with remotely disposed levels the probability of such coincidences is slight.

On the other hand, if resonance levels of other elements are closely disposed (as compared to their width), their total cross section will weakly depend on energy, and without great error they can be replaced by a constant value.

Here, one should keep in mind that group values of cross sections of a given element, in most cases, are comparatively weak functions of the sum of total cross sections of other elements; therefore, error in assignment of this sum (connected with the fact that it is taken as not depending on energy) usually weakly affects results of calculation.

Let us designate the sum of total cross sections of all other elements entering into the medium (counting on one atom of considered element or isotope) by σ_0. Then, from relationships (11), (14), and (19) we obtain expressions for group values of macroscopic cross sections of the defined element as functions of σ_0

$$\bar{\sigma}_c(\sigma_0) = \frac{\left\langle \dfrac{\sigma_c}{\sigma_t + \sigma_0} \right\rangle}{\left\langle \dfrac{1}{\sigma_t + \sigma_0} \right\rangle}, \tag{20}$$

$$\sigma_t(\sigma_0) = \frac{\left\langle \dfrac{1}{\sigma_t + \sigma_0} \right\rangle}{\left\langle \dfrac{1}{(\sigma_t + \sigma_0)^2} \right\rangle} - \sigma_0, \tag{21}$$

$$\bar{\sigma}_S(\sigma_0) = \frac{\left\langle \dfrac{\sigma_e}{\sigma_t + \sigma_0} \right\rangle}{\left\langle \dfrac{1}{\sigma_t + \sigma_0} \right\rangle}, \tag{22}$$

where σ_c, σ_t and σ_e are effective cross sections of the considered isotope, depending on energy; σ_0 does not depend on energy.

If the considered element is present in the medium in small concentration (i.e., $\sigma_0 \to \infty$), then expressions for average-group values of cross sections are simplified:

$$\begin{aligned} \bar{\sigma}_c(\infty) &= \langle \sigma_c \rangle, \\ \bar{\sigma}_t(\infty) &= \langle \sigma_t \rangle, \\ \bar{\sigma}_e(\infty) &= \langle \sigma_e \rangle. \end{aligned} \tag{23}$$

In this case average-group values coincide with the result of simple averaging of cross sections with respect to standard specturm (lethargy).

This considered, in tables of group constants of separate elements are given group values of cross sections, namely for the case when $\sigma_0 \to \infty$, i.e., in tables are given values of cross sections without taking into account resonance blocking.

In additional tables for several values of σ_0 are given values of correction factors by which the above-mentioned values must be multiplied in order to obtain averaged values of cross sections for media with the noted values of σ_0.

During the determination of group cross sections for media with intermediate values of σ_0, it is necessary to use interpolation.

Shown correction factors are designated and determined in the following way:

$$f_c(\sigma_0) = \frac{\bar{\sigma}_c(\sigma_0)}{\bar{\sigma}_c(\infty)} = \frac{1}{\langle \sigma_c \rangle} \cdot \frac{\left\langle \dfrac{\sigma_c}{\sigma_t + \sigma_0} \right\rangle}{\left\langle \dfrac{1}{\sigma_t + \sigma_0} \right\rangle}, \tag{24}$$

$$f_t(\sigma_0) = \frac{\bar{\sigma}_t(\sigma_0)}{\bar{\sigma}_t(\infty)} = \frac{1}{\langle \sigma_t \rangle} \left[\frac{\left\langle \dfrac{1}{\sigma_t + \sigma_0} \right\rangle}{\left\langle \dfrac{1}{(\sigma_t + \sigma_0)^2} \right\rangle} - \sigma_0 \right], \tag{25}$$

$$f_c(\sigma_0) = \frac{\bar{\sigma}_c(\sigma_0)}{\bar{\sigma}_c(\infty)} = \frac{1}{\langle\sigma_c\rangle} \cdot \frac{\left\langle \frac{\sigma_c}{\sigma_t + \sigma_0} \right\rangle}{\left\langle \frac{1}{\sigma_t + \sigma_0} \right\rangle}. \qquad (26)$$

.Correction factor for determination of fission cross section is analogous to the coefficient for capture cross section:

$$f_f(\sigma_0) = \frac{\bar{\sigma}_f(\sigma_0)}{\bar{\sigma}_f(\infty)} = \frac{1}{\langle\sigma_f\rangle} \cdot \frac{\left\langle \frac{\sigma_f}{\sigma_t + \sigma_0} \right\rangle}{\left\langle \frac{1}{\sigma_t + \sigma_0} \right\rangle}.$$

It is obvious that $f_c(\infty) = f_f(\infty) = f_t(\infty) = f_0(\infty) = 1$. Coefficients f can be called coefficients of resonance blocking (or self-shielding). Their values, practically, never exceed unity (although in principle cases are possible when $f_c > 1$). It is necessary to note that the procedure considered here for determination of group values of cross sections is applicable not only for cross sections having resonance character, but also for smoothly varying cross sections. However, for the latter the values of coefficients f, with selected width of groups, in practice are usually found equal to unity.

Let us consider the method of determination of correction factors. In practice there are encountered several cases whose distinction is determined both by peculiarities of structure of cross sections of some or another element in the considered energy band and also by volume of available information about this structure.

1. For the considered energy region there are measurements of energy dependences of cross sections that are made with sufficiently good energy resolution.

Here, correction factors can be determined by substitution in expressions (24)—(26) of energy dependences of cross sections taken from experiments.

2. In the considered energy band resonance levels are remotely disposed (as compared to their width) and parameters of all levels are known.

In this case calculations can be based on the Breit-Wigner for isolated levels (with Doppler broadening). They are simplified if it is possible to disregard interference of potential and resonance scattering. In this case integrals entering into expressions (24)—(26) are reduced the analytic expressions and functions calculated in works [3, 14].

If interference of potential and resonance scattering must be considered, but influence of Doppler broadening can be disregarded, integrals entering into relationships (24)–(26) are also reduced to analytic expressions.

Calculations are complicated if it is necessary simultaneously to consider Doppler broadening and interference of resonance scattering with potential.

However, in the majority of such cases satisfactory accuracy can be ensured by the following approximate approach, which we used. The region of integration of integrals entering into expressions (24)–(26) was broken down into two parts.

The first part included sections lying near resonance peaks. In these sections the influence of Doppler broadening can be considerable, but the influence of interference of potential and resonance scattering still does not show up.

The second part included all other sections (including regions of interference minima of total cross section). In these sections the influence of Doppler effect is slight, since cross sections change little with change of energy on Doppler width. Thanks to this, increases of integrals entering into expressions (24)–(26), appearing because of calculation of interference of potential and resonance scattering, may be considered as independent of temperature of the medium and equal to those occurring when $T = 0$.

Therefore, having determined magnitudes of the considered integrals for different temperatures of the medium without taking into account interference (which can be done with the help of the mentioned tabulated functions) and values of these integrals for $T = 0$, (taking interference into account), it was found possible to determine their values approximately, taking interference into account when $T \neq 0$.

3. The preceding cases are characteristic for low energy groups. For higher groups resonance parameters of separate levels, as a rule, are unknown.

In this case, during calculation of group values of cross sections it is possible to use average estimators of the resonance structure of a cross section (density of levels, mean values, and distribution of partial widths of levels). Here, it is necessary to consider that the presence is possible of several systems of resonance levels with various spin. Values of these characteristics are determined from known parameters of lowest levels and are checked by comparison of mean values of cross sections calculated on their basis with results of measurements (if they are available).

Such calculations are described in the works of Luk'yanov and Orlov [15], Greebler and Hutchins [16].

4. At higher energies resonance levels can overlap (especially when Doppler broadening is taken into account). Here, the influence of resonance effects on group values of cross sections becomes slight. Usually it is less than the influence of inaccuracy of initial data.

In spite of this it is sometimes, nevertheless, expedient to reflect the shown influence in multigroup systems of constants, since it determines such specific effects as temperature coefficients of reactor reactivity.

Theory of resonance effects in the region of overlapping levels at present is weakly developed.

During determination of group values of cross sections, we used method of approximation of Luk'yanov and Orlov [17].

This method takes into account the fluctuation of resonance width, but does not consider fluctuation of distance between levels.

5. Finally, one should note that sometimes the values of quantities entering into expressions (24)–(26) can be directly determined on the basis of measurements carried out with neutron beams having energy width comparable to that of the group intervals.

For instance, measurement of transmission curve of a narrow beam with the help of a detector whose effectiveness weakly depends on energy permits determining of quantities [18, 19]

$$\left\langle \frac{1}{\sigma_t + \sigma_0} \right\rangle; \quad \left\langle \frac{1}{(\sigma_t + \sigma_0)^2} \right\rangle.$$

Measurement of transmission curve of a given element with the help of a detector employing capture in a given element permits determining of

$$\left\langle \frac{\sigma_c}{\sigma_t + \sigma_0} \right\rangle.$$

In conclusion we shall make several remarks of a general character. Presently available information about the resonance structure of cross sections frequently is still very incomplete and inaccurate. Therefore, it is necessary to be content with unreliable theoretical appraisals or conclusion by analogy. Nonetheless, we considered it rational to give in tables also the results of unreliable appraisals of resonance blocking of cross sections, in order to have an idea at least about the order of magnitude of expected effects.

Appraisals of resonance effects are more complicated and unreliable for small values of σ_0 (i.e., for those media in which the considered element is contained in great concentration).

With increase of σ_0 the influence of resonance effects decreases and remains essential only for several lower groups containing high resonances which facilitates appraisal of resonance effects for large values of σ_0. Therefore, for those elements which in reactor media are usually present in small concentrations we were limited to introduction of values of correction factors f for large values of σ_0 (or to indication of that value of σ_0 above which these coefficients can be taken as equal to unity).

Coefficients f_t and f_e are given only for moderate values of σ_0, since it is obvious that for large σ_0 the inaccuracy of definition of these coefficients does not have value even in that case when these coefficients considerably differ from unity. Therefore, errors in interpolation of these coefficients are immaterial.

§ 5. Remarks on Calculation of Heterogeneous Resonance Effects

Systems of group constants given in this book basically are intended for calculation of homogeneous systems. Described methods of averaging of cross sections permit considering effects of homogeneous resonance blocking. However, these data sometimes permit, with certain approximation, consideration of heterogeneous resonance effects also. This can be accomplished by use of different methods of reduction of heterogeneous problems to homogeneous ones. In this paragraph only heterogeneous effects connected with resonance structure of cross sections are discussed, but other heterogeneous effects are not considered. Methods presented in preceding paragraphs for calculation of resonance structure of cross sections during the determination of group constants of the medium are useful only in those cases when the considered region of the medium has uniform composition and its linear dimensions considerably exceed length of free path of neutrons in the given medium.

Certainly, in these cases also the multigroup calculation can insufficiently exactly convey details of space distribution of neutron fluxes and densities of resonance reactions in sections close to boundaries of uniform regions. but this inaccuracy does not have great value, since the indicated sections in the considered cases occupy comparatively small volume.

Furthermore, of great value is the fact that group calculation usually preserves the correct values of full numbers of different reactions in different regions of the medium.

Another situation arises when linear dimensions of certain uniform regions of the medium become comparable with the mean free path of neutrons or less than it.

In these cases methods considered earlier for calculation of resonance structure of cross sections are inapplicable, and it is necessary to consider heterogeneous resonance effects.

In various cases it is expedient to consider heterogeneous resonance effects by different methods. Let us consider two of the most frequently encountered cases.

1. A "thin" block of resonance absorber (plate, rod, etc.) is located in a "thick" (as compared to range of neutrons) moderator block. During calculation of such a system, the absorbing block may be divided into a separate uniform region, characterized by values of group constants. However, determination of group constants for the thin block should be made somewhat differently than was described earlier.

During determination of average-group values of cross sections for regions of the medium having large linear dimensions, it was assumed that integrated spectrum of neutrons in the considered region of the medium has the form

$$\varphi(u) \backsim \varphi_0(u) \frac{1}{\Sigma_t(u)}. \tag{5}$$

This expression did not consider the possibility that a neutron can pass through the considered region of the medium without collision. For the thin block the possibility of through flight is increased. In this case [with those same simplifying assumptions under which relationship (5) is valid] form of integrated specturm of neutrons in the block will be

$$\varphi(u) \backsim \varphi_0(u) \left[\int_0^l e^{-\Sigma_t(u)x}\,dx\right], \tag{27}$$

where l is length of path of neutron in the block (without taking collisions into account). The quantity in brackets is averaged with respect to distribution of shown lengths.

With small thickness of the block, expression (27) can be reduced to form analogous to expression (5)

$$\varphi(u) \backsim \varphi_0(u) \frac{1}{\Sigma_t(u) \frac{1}{\bar{l}}}, \tag{28}$$

where $\bar{l}$ — mean value of l, equal to

$$\bar{l} \approx \frac{4V}{S}, \tag{29}$$

where V — volume of block; S — area of its surface.

Proceeding from expression (28), we find that the simplest method of introduction of correction for the considered effect consists in the following. During determination of group values of cross sections of elements entering in composition of absorbing block, quantity σ_0 (i.e., sums of total cross sections, referred to one atom of considered element, of all other elements entering in composition of the block) is replaced by quantity σ_0 determined as

$$\overset{\bullet}{\sigma}_0 = \sigma_0 + \frac{1}{\rho \bar{l}}, \qquad (30)$$

where ρ is density of nuclei of the considered element in material of the block.

Accuracy of the described method of introduction of correction decreases with increase of $\bar{l}$. However, the correction, here, becomes small. It is possible to note that correction should be introduced not only for absorbing blocks, but also in all cases when the thin block has resonance arrangement of the cross sections.

This is true, for instance, if propagation of intermediate neutrons is calculated in a system which consists of moderator layers and structural layers of materials having the resonance structure of the scattering cross sections.

It is necessary, however, to distinguish two cases: when neutrons of a considered group penetrate the block basically from without, and when they arise in the block itself (owing to deceleration within the material of the block).

In the second case mean free path of a neutron in the considered medium (without taking collisions into account) is approximately twice shorter than in the first. Therefore, a somewhat different introduction of correction is more correct

$$\overset{\bullet}{\sigma}_0 = \sigma_0 + \frac{2}{\rho \bar{l}}, \qquad (31)$$

If doubts arise as to which of the two cases applies, it is best to introduce correction having intermediate value:

$$\sigma^{*} = \sigma_0 + \frac{1{,}5}{\rho \bar{l}}.$$

2. Very frequently the considered region of the medium has heterogeneous structure, but consists of a great number of identical cells. In this case it can be expedient to consider the medium on the whole as homogeneous, introducing, however, corrections for heterogeneity of its structure during the determination of group values of cross sections.

An example of this is a medium consisting of alternating blocks of moderator and resonance absorber.

If thickness of the moderator blocks is much less than mean free path of neutrons in the material of the moderator, determination of group values of cross sections, obviously, can be done just as for the homogeneous medium. When the thickness of moderator blocks becomes comparable with the mean free path of neutrons in the moderator (but not greater than the latter), correction for heterogeneity of the medium can be introduced, for instance, by the following approximate method.

During the calculation of quantities σ_0 (for medium on the whole), total cross section of nuclei of the moderator is replaced by the effective value, equal to

$$\sigma_t^* = \sigma_t\left(1 - \frac{\rho\sigma_t\bar{l}}{2}\right), \qquad (32)$$

where σ_t is total cross section of nuclei of the moderator; ρ is density of nuclei of the moderator (in moderator blocks); $\bar{l}$ is average length of path of neutrons passing through the moderator blocks (without taking collisions into account).

If thickness of the moderator blocks exceeds length of mean free path of neutrons in the material of the moderator, it is expedient to base homogenization of the medium preliminary heterogeneous calculation of the individual cell (as this is usually done during calculation of thermal reactors). Procedure for determination of group constants of the homogeneous medium from results of heterogeneous calculation will not be considered here. We shall determine only group values of cross sections for preliminary calculation of a cell.

Group values of cross sections for materials of moderator blocks and absorbing blocks are determined separately (see first case). However, if the thickness of moderator blocks exceeds the mean free path of neutrons, but not by so much that it is possible to disregard the possibility of flight of a neutron through the moderator block, it is necessary to consider a phenomenon usually called mutual resonance shielding of blocks. Approximate calculation of this phenomenon can consist in that during determination of quantities σ_0^* by formula (30), the value of $\bar{l}$ is replaced by the effective value

$$\bar{l}^* = \bar{l}\,\frac{1}{1-P},$$

where P is the probability that a neutron will pass through the moderator block without collisions. Although during derivation of this formula it was assumed that the absorbing blocks are thin, it can, however, be used in the opposite case (since, here, even large error in assignment of $\bar{l}$ does not lead to essential change of group values of cross sections of the absorber block).

In conclusion one should once again note that methods of calculation of heterogeneous resonance effects mentioned in the paragraph are very approximate. Strict calculation of these effects exceeds the bounds of the possibilities presented by preliminarily composed systems of group constants.

§ 6. Determination of the Deceleration Cross Section

Deceleration cross section of neutrons of a defined group depends not only on effective cross sections of the medium, but also on the form of the intragroup spectrum, and on width of the group. Therefore, in distinction from other group constants, the deceleration cross section of neutrons can vary considerably, depending upon the form of the intragroup spectrum, even in the case when all elemental cross sections within the limits of the group do not depend on energy. This circumstance can necessitate additional correction of tabular values of the deceleration cross section.

Deceleration cross section is composed of the deceleration cross sections due to elastic and inelastic scattering

$$\sigma_{\text{з}} = \sigma_{\text{з}(e)} + \sigma_{\text{з}(in)}.$$

Cross Section of Elastic Deceleration

Let us consider only those cases when the width of the group exceeds loss of energy during elastic scattering. To begin with we shall consider that within the limits of a considered group the effective cross sections do not depend on energy.

Here, the cross section of elastic deceleration is equal to

$$\sigma_{\text{з}(e)} = \frac{\int\limits_{u=u_2-\delta}^{u=u_2} \varphi(u)\,du\,\sigma_e \int\limits_{u'=u_2}^{u'=u+\delta} q(u, u')\,du'}{\int\limits_{u_1}^{u_2} \varphi(u)\,du}, \tag{33}$$

where q(u, u') is standardized spectrum of elastically scattered neutrons (i.e., the probability that a neutron with lethargy u after elastic scattering will have lethargy u'); δ is maximum increase of lethargy during elastic scattering; u_2 and u_1 are lower and upper limits of the group; $\varphi(u)$ is neutron spectrum in the group. If loss of energy during elastic scattering is small as compared to width of the group, expression (33) can be replaced by approximate expressions, which it is convenient to present as:

$$\sigma_{з(у)} = \frac{\xi\sigma_e}{\Delta u} b,$$

$$b \approx \frac{\varphi\left(u_2 - \frac{2}{3}\xi\right)}{\overline{\varphi(u)}} \approx \frac{\varphi(u_2)}{\overline{\varphi(u)}}, \tag{34}$$

where ξ is average increase of lethargy during elastic scattering;

$$\Delta u = (u_2 - u_1)$$

$$\overline{\varphi(u)} = \frac{1}{\Delta u} \int_{u_1}^{u_2} \varphi(u) du.$$

For the Fermi spectrum (which we consider as "standard" for all groups, except the three upper ones) b = 1.

In tables of constants in addition to group values of σ_e and ξ there are given values of $\sigma_{d(e)}$, calculated for standard form of spectrum. These values in all cases can be used as the first approximation. However, if high accuracy is required, it is possible to switch to the following approximation.

For this the problem is first calculated in the first approximation. On the basis of this calculation histograms of spectra are constructed (better than the integral type) for different regions of the considered system. These histograms are described by smooth curves, on the basis of which by formulas (34) we determine more exact values of factors b, and then of $\sigma_{d(e)}$ also. The last values are also used during calculation of systems in the second approximation. Sometimes a simpler solution to the problem is possible. For instance, if homogeneous regions of the considered system have sufficiently large dimensions during preliminary appraisal of the spectrum (necessary for determination of $\sigma_{d(e)}$) it is possible to disregard neutron leakage and to base calculations on the form of the neutron spectrum in infinite medium. Calculation of the latter, of course, is simpler than complete space-energy calculation of the system.

During the designing of the reactor core, as preliminary spectrum it is sometimes possible to use the spectrum a "bare" reactor of the same composition, etc.

In calculations the necessity of use of definitized values of deceleration cross sections most frequently arises for strongly absorbing media and, in particular, those (usually lower) groups whose deceleration cross section is comparable with the absorption cross section or less than it. Usually for these groups inelastic scattering plays no role and neutron leakage from the considered region of the medium is small as compared to absorption. Here, it is expedient to determine the deceleration cross section by proceeding from the fact that it should lead to value of the probability of a neutron's avoidance of absorption during elastic deceleration within limits of the considered group.

We shall designate this probability by P and determine deceleration cross section in the following way

$$\Sigma_{s(e)} = \Sigma_a \left(\frac{P}{1-P}\right). \tag{35}$$

The value of P can be determined from a certain age expression (better through refinement due to Greuling and Goertzel)

$$P = \exp\left(-\frac{\Sigma_a \Delta u}{\xi \Sigma_e + \gamma \Sigma_a}\right) \approx \exp\left[-\frac{\Sigma_a \Delta u}{\xi\left(\Sigma_e + \frac{2}{3}\Sigma_a\right)}\right]. \tag{36}$$

Into expressions (35) and (36) enter total macroscopic cross sections of the medium and the value of ξ averaged with respect to elements, which is equal to

$$\bar{\xi} = \frac{1}{\sum_i \Sigma_{e,i}} \sum_i \xi_i \Sigma_{e,i},$$

where i is index of elements entering into the medium. It is necessary to note that for application of the considered approach to determination of more precise value of the deceleration cross section it is necessary that capture of neutrons of a given group in the considered region of the medium exceed not only neutron leakage from this region, but also influx of neutrons from other regions (i.e., absolute value of leakage should be small and should not depend on sign of leakage).

The last condition impracticable, for instance, for a strongly absorbing medium, surrounded by a weakly absorbing moderator.

Till now we assumed that within limits of the considered groups the cross section of elastic scattering (like the absorption cross section) does not depend on the energy of the neutrons.

Since in reality this dependence exists, in formulas (34)—(36) it is necessary to use average-group values of cross sections. This is justified, since methods averaging utilized during determination of average-group values of cross sections are selected in such a way that replacement of the true arrangement of cross sections by constant average-group values preserves correct values of the basic characteristics of propagation of neutrons in the media. Consequently, if for a considered group resonance effects are of essential value, during calculation of the cross section of elastic deceleration, instead of the tabular value of σ_e one should use

$$\sigma_e' = \sigma_d f_e(\sigma_0),$$

where σ_e is the tabular value of the cross section of elastic deceleration when $\sigma_0 = \infty$. Accordingly, instead of the tabular value of $\sigma_{d(e)}$ in these cases one should use

$$\sigma_{\text{з}(e)}' = \sigma_{\text{з}(e)} f_e,$$

where $\sigma_{d(e)}$ is the tabluar value of the cross section of elastic deceleration.

It is possible to note that considerations leading to formulas (34) can provoke the thought of using, during calculation of the cross section of elastic deceleration, the value of the cross section of elastic scattering near the lower boundary of the group. However, such solution would be inexpedient:

1) it would be strict, if in formulas (34) there were used the exact form of the neutron spectrum inside the groups. But the above-described procedure of successive approximations assumes use of smoothed form of spectrum, not considering the details of arrangement of cross sections inside the groups;

2) here, it would be impossible to definitize the value of the deceleration cross section by formulas (35) and (36).

In conclusion one should note that values of ξ given in the tables pertain to scattering on free and motionless atoms.

However, such assumption for the very lowest groups of the considered energy band can sometimes be insufficiently exact. As was already noted, questions connected with the taking into account of the thermal motion and molecular or crystal binding of atoms are not considered in this book.

Calculation of the thermal motion and coupling of dispersing atoms has decisive value during the determination of the propagation of neutrons of thermal energies and in this case should be precise.

However, for intermediate groups of neutrons whose energy appreciably exceeds the energy of thermal motion it is sometimes possible to limit oneself to approximate calculation of the considered effects. Since for neutrons belonging to these groups the probability of gaining energy during scattering still remains essentially lower than the probability of losing energy, during calculation of the deceleration cross section, it is possible to limit oneself to the use of corrected values of ξ. For this purpose, in a separate table there are given temperature corrections for group values of ξ for beryllium and graphite. They were calculated on the bases of data obtained by V. F. Turchin [20]. Corrections are also given for group values of ξ resulting from the model of gaseous moderator [20]:

$$\frac{\xi(E_0, kT)}{\xi_0} \simeq \frac{\frac{\langle E-E'\rangle}{E} + \frac{1}{2}\frac{\langle (E-E')^2\rangle}{E^2}}{\frac{1}{2}\gamma\left(1+\frac{\gamma}{3}\right)},$$

where $\gamma = \dfrac{4A}{(A+1)^2}$;

$$\frac{\langle E-E'\rangle}{E} =$$

$$= \frac{1}{1+\frac{1}{2a}\frac{kT}{E}}\left[\frac{2}{A}\left(1-\frac{2}{A}+\frac{3}{A^2}\right)-\frac{4}{A}\left(1-\frac{5}{2A}+\frac{4}{A^2}\right)\frac{kT}{E}\right];$$

$$\frac{\langle (E-E')^2\rangle}{E^2} =$$

$$= \frac{1}{1+\frac{1}{2A}\frac{kT}{E}}\left[\frac{16}{3A^2}\left(1-\frac{4}{A}\right)+\frac{4}{A}\left(1-\frac{10}{A}+\frac{37}{A^2}\right)\frac{kT}{E}\right].$$

Here ξ_0 is value of ξ when $T = 0$; A is atomic weight of nucleus; E and E' are energies of neutrons, respectively, before and after scattering.

At $A > 20$ dependence of ξ on atomic weight becomes immaterial.

The given formula gives good approximation when $kT < 0.3E$. At higher temperatures, use of this formula for calculation becomes unlawful; however, in this region, in general, it is impossible to use the offered method of approximation for the calculation of thermal motion.

The given data can be used during appraisal of effect and for crystalline materials with low Debye temperature.

Cross Section of Nonelastic Deceleration

In the tables are given group values of the total cross section of inelastic scattering and cross sections determining transitions between separate groups, including the values of the inelastic scattering cross section, in which a neutron remains in the same group. These values were obtained by simple averaging of energy dependences of cross sections with respect to standard form of the spectrum.

Cross section of nonelastic deceleration, according to these data, can be defined as the difference between the total cross section of inelastic scattering and the inelastic scattering cross section, in which a neutron remains in the considered group

$$\sigma_{s(in),i} = \sigma_{in,i} - \sigma_{in(i,i)}. \tag{37}$$

It is necessary to note that during the determination of the deceleration cross section, owing to inelastic scattering (just as for cross sections of inelastic transitions), the question of calculation of possible distinctions in form of the spectrum from standard does not arise so sharply as during elastic deceleration.

Therefore, it is almost always possible to limit oneself to use of the tabular values of cross sections.

An exception to this is the calculation of media composed of heavy elements whose nuclei have low-disposed levels (those meant here are levels of the target nucleus).

If in the considered group inelastic scattering occurs with excitation of levels whose energy is considerably less than width of the group, the loss of energy in every event of inelastic scattering will also be less than the width of the group.

Here, inelastic deceleration becomes similar to the elastic type.

Accordingly, corrections for distinction in form of the neutron spectrum in a group from the standard can also take on certain value. These corrections can be introduced with the help of the method of successive approximations, analogous to the described method for elastic deceleration. Whether the considered case applies is easily established, proceeding from data given in tables of group constants.

Actually, it applies for those groups for which:

$$\sigma_{in(i,i)} > \sigma_{in(i,i+1)}.$$

In the opposite case, when $\sigma_{in(i,i)} < \sigma_{in(i,i+1)}$, inelastic scattering with excitation of low levels does not have essential value and correction is not required. If the first case applies, the magnitude

$$\delta = \frac{\sigma_{in(i,i+1)}}{\sigma_{in(i,i)} + \sigma_{in(i,i+1)}} \Delta u$$

is approximately equal to the average increase of lethargy during inelastic scattering and, consequently, it is analogous to the magnitude of ξ for elastic deceleration. Therefore, when, as a result of the first approximation, a more exact form of the neutron spectrum inside a group is determined, the definitized value of the cross section of transition to a neighboring group can be determined by a formula analogous to (34)

$$\sigma'_{in(i,i+1)} = [\sigma_{in(i,i)} + \sigma_{in(i,i+1)}]\frac{\delta}{\Delta u}\frac{\varphi\left(u_2 - \frac{\delta}{2}\right)}{\overline{\varphi(u)}} =$$

$$= \sigma_{in(i,i+1)} \cdot \frac{\varphi\left(u_2 - \frac{\delta}{2}\right)}{\overline{\varphi(u)}} \qquad (38)$$

(prime denotes definitized values). Accordingly, the value of $\sigma_{in(i,i)}$ should also be corrected:

$$\sigma'_{in(i,i)} = \sigma_{in(i,i)} - (\sigma'_{in(i,i+1)} - \sigma_{in(i,i+1)}). \qquad (39)$$

Cross sections of transitions to groups lower than neighboring ones remain as formerly.

§ 7. Rules for use of Systems of Constants

In conclusion of this chapter we shall give a short summary of the rules for use of systems of constants.

The following designations are used in tables:

σ_t — average-group value of total cross section. (This and all other average-group values pertain to standard form of the spectrum. In resonance structure they are used directly only for media which contain the considered element in small concentration);

σ_f — average-group value of fission cross section;

ν — average-group value of number of secondary neutrons. This number includes neutrons emitted before fission in the reaction (n, nf);

ε_k — fraction of k-th group in the fission spectrum;

σ_c — average-group value of capture cross section;

σ_{in} — average-group value of inelastic scattering cross section. It includes reaction cross section (n, 2n) and all other reactions accompanied by emission of secondary neutrons (except fission);

$\sigma_{in(i,i+k)}$ — cross section of inelastic transitions from i-th group to (i + k)-th. This cross section takes into account the possibility of the multiplication of neutrons in reaction (n, 2n);

$\mu_{in(i,i+k)}$ — mean value of cosine of angle of inelastic scattering during transition from i-th group to (i + k)-th. It is given for elements with $A < 20$;

σ_e — average-group value of cross section of elastic scattering;

μ_e — group value of average cosine of angle of elastic scattering;

ξ — group value of average increase of lethargy during elastic scattering;

$\sigma_{d(e)}$ — cross section of elastic deceleration;

$\mu_{d(e)}$ – mean value of cosine of angle of elastic scattering in which there occurs transition to a neighboring lower group. It is given for elements with $A < 20$;

$\sigma_{e(i,i+k)}$ – cross section of transition from i-th group to $(i + k)$-th, caused by elastic scattering. It is given for elements with A <   (when elastic scattering causes transitions to several lower groups);

$\mu_{e(i,i+k)}$ – mean value of cosine of angle of elastic scattering in which there occurs transition from i-th group to $(i + k)$-th. It is given for elements with $A < 6$;

f_c – Coefficient considering the influence of resonance self-shielding on average-group value of the capture cross section;

f_f – coefficient considering the influence of resonance self-shielding on average-group value of fission cross section;

f_t – coefficient considering the influence of resonance self-shielding on average-group value of total cross section (utilized during determination of average-group value of transport cross section);

f_e – coefficient considering influence resonance self-shielding on average-group value of cross section of elastic scattering (utilized during determination of cross section of elastic deceleration).

Definition of Average-Group Values of Cross Sections

If introduction of corrections for resonance self-shielding is not required, those values given in the basic tables are used as average-group values directly.

In the opposite case these corrections are introduced with the help of f coefficients, given in additional tables.

For this there first are determined group values of quantities $\sigma_{0,l}$ (i.e., of those sums of total cross sections of all other elements entering into the medium, referred to one atom of the l-th element):

$$\sigma_{0,l} = \frac{1}{\varrho_l}\sum_{m \neq l} \sigma_{t,m}\varrho_m,$$

where $\sigma_{t,m}$ – total cross section of m-th element (differing from that considered); ρ_l – concentration of nuclei of the considered l-th element; ρ_m – concentration of nuclei of m-th element.

If cross sections of other elements do not have resonance character, then as $\sigma_{t,m}$ the tabular values are used.

If, however the last condition is not satisfied, then in the first approximation self-shielding of cross sections of other elements can be considered by using as $\sigma_{t,m}$ the values of $\sigma^{*}_{t,m}$, determined in the following way:

$$\dot{\sigma}_{t,m} = \sigma_{c,m} f_{c,m}\left(\frac{1}{\varrho_m}\sum_{n\neq m}\sigma_{t,n}\varrho_n\right) + \sigma_{f,m} f_{f,m}\left(\frac{1}{\varrho_m}\sum_{n\neq m}\sigma_{t,n}\varrho_n\right) +$$
$$+ \sigma_d f_{e,m}\left(\frac{1}{\varrho_m}\sum_{n\neq m}\sigma_{t,n}\varrho_n\right) + \sigma_{in}.$$

After determination of group values of σ_0 (separately for every element entering in the composition of the considered medium), in additional tables there are found the f coefficients corresponding to values of σ_0.

Since in the tables the f coefficients are given only for separate values of σ_0 and only for certain temperatures (when they depend on temperature), it is necessary to use interpolation for intermediate cases.

After determination of f coefficients, average-group values of cross section of the given element for the considered medium are found by the formulas:

$$\begin{aligned}
\bar{\sigma}_c &= \sigma_c f_c(\sigma_0, T);\\
\bar{\sigma}_f &= \sigma_f f_f(\sigma_0, T);\\
\bar{\sigma}_e &= \sigma_d f_e(\sigma_0, T);\\
\bar{\sigma}_t &= \dot{\sigma}_t f_t(\sigma_0, T);\\
\bar{\sigma}_{in} &= \sigma_{in},
\end{aligned}$$

where the quantities σ_c, σ_f, σ_e, σ_t and σ_{in} are taken from the tables. Other group constants, pertaining to the second type (ν, ξ, μ_e), in all cases are taken directly from the tables.

Determination of Group Constants (of the First Type)

Average-group values of σ_f, σ_c and ν are also group constants of the first type (see § 1).

Then, deceleration cross section, which is composed of cross section of elastic and cross section of nonelastic deceleration, is determined:

$$\sigma_{з} = \sigma_{з(e)} + \sigma_{з(in)}.$$

If introduction of corrections for distinction in form of the spectrum within a group from the standard and for resonance shielding are not required, then as $\sigma_{d(e)}$ the tabular values are used, while $\sigma_{d(in)}$ is determined from the tabular data as

$$\sigma_{з(in),i} = \sigma_{in,i} - \sigma_{in(i,i)}.$$

If introduction of the mentioned corrections is desirable it is done according to § 6. Then, total cross sections of transitions between groups are determined, i.e., $\sigma_{d(i,k)}$.

For heavy elements, when elastic deceleration causes transition to one neighboring lower group, total cross sections of transitions are equal to

$$\sigma_{s(i,\, i+1)} = \sigma_{s(e)} + \sigma_{in\,(i,\, i+1)}$$

and

$$\sigma_{s(i,\, i+k)} = \sigma_{in\,(i,\, i+k)} \text{ for } k > 1.$$

For lighter elements

$$\sigma_{s(i,\, i+k)} = \sigma_{e(i,\, i+k)} + \sigma_{in\,(i,\, i+k)}.$$

Then scattering cross section, leaving the neutron in the considered group, i.e., σ_s.

$$\sigma_{p,\, i} = \bar{\sigma}_{t,\, i} - \bar{\sigma}_{f,\, i} - \bar{\sigma}_{c,\, i} - \bar{\sigma}_{s,\, i},$$

where $\bar{\sigma}_t$, $\bar{\sigma}_f$ and $\bar{\sigma}_c$ – group values of cross sections for the given medium. One should be forewarded against the apparent possibility of determination of σ_s by the formula

$$\sigma_{p,\, i} = \bar{\sigma}_{e,\, i} - \sigma_{s(e),\, i} + \sigma_{in\,(i,\, i)}.$$

This expression is correct only if resonance self-shielding is absent. In the opposite case it becomes invalid, since the value of $\bar{\sigma}_e$ (determination of which has already been described) is intended only for determination of the cross section of elastic deceleration.

The last ones determined are group constants depending on anisotropy of scattering.

Values of these constants depend on character of the utilized approximation. Below are given expressions for determination of mean values of cosines of transitions and transport cross sections for two variants of transport approximations.

Expressions are given also for determination of mean values of cosine $\mu_{(i,i)}$ of scattering angle, leaving the neutron in the considered group. Although in transport approximations these values are not used directly, they are needed in other cases (see § 1).

Asterisks denote simpler expressions, utilized without correction for resonance self-shielding.

a. Multigroup transport approximation with isotropic transitions ("corrected" – with respect to calculation of anisotropy of elastic scattering, and "simple" – with respect to calculation of anisotropy of inelastic scattering).

$$\mu_{(i,\,i+k)} = 0 \text{ for } k > 0$$

$$\mu_{in\,(i,\,i)} = 0$$

$$\mu_{e\,(i,\,i)} = \frac{(\bar\sigma_{t,\,i} - \bar\sigma_{f,\,i} - \bar\sigma_{c,\,i} - \bar\sigma_{in,\,i})\,\mu_{e,\,i}}{(\bar\sigma_{t,\,i} - \bar\sigma_{f,\,i} - \bar\sigma_{c,\,i} - \bar\sigma_{in,\,i} - \bar\sigma_{3\,(e)})};$$

$$\mu_{e\,(i,\,i)} = \frac{\sigma_{e,\,i} \cdot \mu_{el}}{\sigma_{el} - \sigma_{3\,(e),\,i}};^{*}$$

$$\mu_{(i,\,i)} = \frac{1}{\sigma_{p,\,i}}(\bar\sigma_{t,\,i} - \sigma_{f,\,i} - \sigma_{c,\,i} - \sigma_{in,\,i} - \sigma_{3\,(e)})\,\mu_{e\,(i,\,i)};$$

$$\mu_{(i,\,i)} = \frac{1}{\sigma_{p,\,i}}(\sigma_{e,\,i} - \sigma_{3\,(e),\,i})\,\mu_{e\,(i,\,i)};^{*}$$

$$\sigma_{tr,\,i} = (\sigma_{t,\,i} - \bar\sigma_{f,\,i} - \bar\sigma_{c,\,i} - \bar\sigma_{in,\,i})(1 - \mu_{e,\,i}) + \bar\sigma_{c,\,i} + \bar\sigma_{f,\,i} + \bar\sigma_{in,\,i};$$

$$\sigma_{tr,\,i} = \sigma_{e,\,i}(1 - \mu_{e,\,i}) + \sigma_{c,\,i} + \sigma_{f,\,i} + \sigma_{in,\,i};^{*}$$

$$\sigma_{p,\,tr,\,i} = (\bar\sigma_{t,\,i} - \bar\sigma_{f,\,i} - \bar\sigma_{c,\,i} - \sigma_{in,\,i})(1 - \mu_{e,\,i}) + \sigma_{in,\,i} - \sigma_{3\,(e),\,i};$$

$$\sigma_{p,\,tr,\,i} = \sigma_{e,\,i}(1 - \mu_{e,\,i}) + \sigma_{in,\,i} - \sigma_{3\,(e),\,i}.^{*}$$

b. Multigroup transport approximation with anisotropic transitions.

Systems of constants given in this book provide for the possibility of direct calculation of anisotropy of transitions only for elements with A < 20. Form of assignment of data differs somewhat for elements with A < 6 and elements with A > 6. (In the first case, elastic scattering causes transition to several neighboring groups, in second, only to one).

1. A < 6.

$\mu_{e\,(i,\,i+k)}$ and $\mu_{in\,(i,\,i+k)}$ — are given in the tables

$$\mu_{i,\,i+k} = \frac{\sigma_{e\,(i,\,i+k)}\mu_{e\,(i,\,i+k)} + \sigma_{in\,(i,\,i+k)}\mu_{in\,(i,\,i+k)}}{\sigma_{e\,(i,\,i+k)} + \sigma_{in\,(i,\,i+k)}};^{*}$$

$$\sigma_{tr,\,i} = \sigma_{e\,(i,\,i)}(1 - \mu_{e\,(i,\,i)}) + \sigma_{in\,(i,\,i)}(1 - \mu_{in\,(i,\,i)}) + \sigma_{c};^{*}$$

$$\sigma_{p,\,tr,\,i} = \sigma_{e\,(i,\,i)}(1 - \mu_{e\,(i,\,i)}) + \sigma_{in\,(i,\,i)}(1 - \mu_{in\,(i,\,i)}).^{*}$$

2. A ≥ 6

$\mu_{in\,(i,\,i+k)}$ and $\mu_{e\,(i,\,i+1)} = \mu_{3\,(e)}$ are given in the tables.

$$\mu_{e\,(i,\,i)} = \frac{(\sigma_{t,\,i} - \bar\sigma_{c,\,i} - \bar\sigma_{in,\,i})\,\mu_{e,\,i} - \sigma_{3\,(e),\,i}\,\mu_{3\,(e,\,i)}}{(\bar\sigma_{t,\,i} - \bar\sigma_{c,\,i} - \bar\sigma_{in,\,i} - \sigma_{3\,(e,\,i)})};$$

$$\mu_{e\,(i,\,i)} = \frac{\sigma_{e,\,i}\mu_{e,\,i} - \sigma_{3\,(e),\,i}\mu_{3\,(e),\,i}}{(\sigma_{e,\,i} - \sigma_{3\,(e),\,i})};^{*}$$

$$\mu_{l,i} = \frac{1}{\sigma_{p,i}} \left[\left(\bar{\sigma}_{t,i} - \bar{\sigma}_{c,i} - \bar{\sigma}_{in,i} - \sigma_{s(e),i} \right) \mu_{e(l,i)} + \sigma_{in(l,i)} \mu_{in(l,i)} \right];$$

$$\mu_{l,i} = \frac{1}{\sigma_{p,i}} \left[\left(\bar{\sigma}_{c,i} - \sigma_{s(e),i} \right) \mu_{e(l,i)} + \sigma_{in(l,i)} \mu_{in(l,i)} \right];^{*}$$

$$\sigma_{tr,i} = \sigma_{p,i} (1 - \mu_{l,i}) + \sigma_{s,i} + \bar{\sigma}_{c,i};$$

$$\sigma_{tr,i} = \sigma_{p,i} (1 - \mu_{l\ i}) + \sigma_{s,i} + \sigma_{c,i};^{*}$$

$$\sigma_{p,tr} = \sigma_{p,i} (1 - \mu_{l,i}).$$

CHAPTER II

SURVEY OF DATA USED

In this chapter a short survey is given of experimental and theoretical data used during composition of the system of group constants.

A considerable part of the experimental data on the interactions of fast and intermediate neutrons with nuclei was taken from the atlas of neutron cross sections [21] and from the reference book on nuclear-physical constants for designing of reactors by Gordeyev, Kardashev, and Malyshev [22].

In addition, there were also used results of works not included in the above-mentioned collections, or which appeared after their publication.

If in experimental data there were contradictions or experimental data were absent, we used results of theoretical calculations and results of appraisals founded on the systematization of data pertaining to other elements.

In certain cases, during the selection of values of group constants, we used results of macroscopic experiments (of investigation on reactors, critical assemblies, and so forth).

§ 1. Fission Cross Sections

Fissionable isotopes: U^{233}, U^{235}, Pu^{239}, Pu^{241}. Fission cross sections of U^{233}, U^{235}, and Pu^{239} were measured quite well for a wide range of neutron energy.

For the region of low energies data is available on measurements made on time-of-flight velocity selectors, which are given in works [23-29, 106, 140-142]; results of the majority of these measurements are contained in the atlas [21].

Also used were values of resonance parameters and other data given, in addition to the enumerated works, in works [123-139, 145, 146, 287].

For the region of fast neutrons, besides the measurements given in works [30-33] and others, results of which are contained in atlas [21], the measurements of Gorlov and others [34] were used (E_n = 3 to 800 kev), Smirenkin and others [35] (E_n = = 0.2 to 2.5 Mev), Pankratov and others [36, 37] ($E_n \geq 3$ Mev), and also works [38, 39, 103].

Results of recent measurements of the fission cross section of the considered isotope satisfactorily agree among themselves at all energies, excluding the region of intermediate energies ($E_n \approx 0.5$ to 100 kev).

For the last one less data are available and they agree less well among themselves. During selection of group values of the fission cross section for this energy band, there were considered results of comparison of multigroup calculations with results of macroscopic experiments.

Fission cross section and resonance parameters of Pu^{241} for neutrons with energy below 100 ev are given in works [21, 23, 40, 138, 142, 143, 161]. Fission cross section of Pu^{241} under the influence of fast neutrons was measured by Batler and others [41, 42] (E_n = 0.02 to 1.8 Mev) and by Kazarinova and others [43] (E_n = 2.5 to 14 Mev).

Results of these works agree poorly among themselves. Using the data of work [42], for neutrons with energy of 2.5 Mev one should have expected σ_f = 1.7 to 1.8 barn, which is considerably greater than the value obtained by Kazarinova and others [43] (σ_f = 1.2 barn).

It is necessary to note that the large values of the fission cross section obtained by Batler [42] do not agree with the systematics of fission cross sections of fast neutrons and γ-rays.

Systematics shows that the fraction of fission in decay of compound nuclei with fixed Z monotonically decreases with increase of atomic weight [43-45]. Based on this regularity, one should have expected that the fission cross section of Pu^{241} of neutrons with energy of 1-5 Mev will be smaller than the corresponding cross section for Pu^{240}.

Values obtained in work [43] agree with this conclusion, whereas quantities given in [42] contradict it.

In tables of group constants are given data lying between the values obtained in the mentioned works.

They qualitatively agree with the systematics of cross sections (although on the basis of systematics alone one should have selected still smaller values). Fission cross section of Pu^{241} for intermediate energies was chosen on the basis of interpolation of data pertaining to slow and fast neutrons. It was assumed that the arrangement of the fission cross section of Pu^{241} is analogous to that of the fission cross section of Pu^{241} is analogous to that of the fission cross section of U^{233}.

Isotopes having fission threshold: Th^{232}, U^{234}, U^{236}, U^{238}, Pu^{240} , and Pu^{242}. For Th^{232}, U^{234}, U^{236}, and U^{238} there were used data given in works [21, 31, 32, 36, 43, 46-52]. Of these isotopes of the greatest practical value is fission of U^{238}.

Selected group values of the fission cross section of U^{238} lead to correct fission cross section of U^{238} for neutrons with fission spectrum $\sigma_f = 0.31$ barn [50-52].

Fission cross section of Pu^{240} was measured by Nesterov and Smirenkin [53], Dorofeyev and Dobrynin [38]; results of measurements taken at Los Alamos are given in work [21]. Data of these works agree among themselves, with the exception of those for the low-energy region ($E_n < 0.4$ Mev).

In this energy band, according to Butler [53], drop of fission cross section of Pu^{240} with decrease of energy of neutrons occurs less sharply than follows from results of [21]. Fission cross section of Pu^{242} was measured by Butler [54] and others. Values obtained by them of fission cross section for Pu^{242}, just as for Pu^{241}, seem excessive from the point of view of the mentioned systematics of fission cross sections. Values given in the tables lie between values obtained by Batler and the values following from systematics of cross sections. Let us discuss the question of selection of fission cross sections of the considered isotopes in the region of low energies of neutrons, corresponding to subbarrier fission. For isotopes with low threshold of fission (Pu^{240}, Pu^{242}, U^{234}) it is possible to expect preservation of noticeable values of fission cross sections down to minute neutron energies. Since direct measurements of cross sections for this energy band are few and are of low accuracy, it is necessary to use extrapolation of results of measurements pertaining to higher energies. Proceeding from the theory of subbarrier fission, it is expedient to use linear extrapolation on graph of dependence of logarithm of cross section on energy of neutrons (and not the usual graph in twice-logarithmic scale). However, results of such simple extrapolation have to be corrected for energy dependence of cross section of formation of the compound nucleus in needed state.

The last circumstance means that at energies below approximately 0.2 Mev the decrease of fission cross section with decrease of energy of the neutrons should occur less sharply than at higher energies. So that it is possible to introduce correction for the change of cross section of formation of compound nucleus, it is necessary to know the value of l for neutrons exciting the low energy channel of fission. As Wheeler noted [55], data of fission of Pu^{240} of slow neutrons, probably, indicate that the lowest channel of fission is excited by P-neutrons. We used this assumption, although it is unreliable.

§ 2. Average Number of Secondary Neutrons

Fissionable isotopes: U^{233}, U^{235}, Pu^{239}, Pu^{241}. Measurements in recent years have noticeably decreased the conventional values of ν for basic fissionable isotopes. In tables are accepted the following values of ν for nuclear fission of thermal neutrons $U^{233} - \nu = 2.49$; $U^{235} - \nu = 2.42$; $Pu^{239} - \nu = 2.87$; $Pu^{241} - \nu = 2.96$. Numerous measurements of the energy dependence of ν (see surveys of Terrell [56], Bondarenko and others [57], and Smith [58] , in general, confirm the conclusion concerning the approximate linear increase of ν with energy of neutrons, which follows from the assumption about the constancy of kinetic energy of fission fragments (Usachev and Trubintsyn [59] and Leachman[60]). The mentioned assumption leads to the following expression for quantity $\frac{\partial \nu}{\partial E}$ [57]:

$$\frac{\partial \nu}{\partial E} \approx \frac{0.9}{E_{cs} + 2T},$$

where E_{bo} — average binding energy of a neutron in nuclei-fragments; 2T — average energy of evaporated neutrons. This expression is applicable to energy of about 6.5 Mev above which there appears fission with preliminary emission of neutrons.

But, since values of ν of neighboring isotopes are close, and binding energies of a neutron in fissionable nuclei do not strongly differ from average binding energy of a neutron in nuclei-fragments, then, following from the given expression, the linear dependence of ν is preserved approximately at higher energies. (Here, it is considered that preliminarily emitted neutrons are united with fission neutrons). Experimental determinations of quantity $\frac{\partial \nu}{\partial E}$ give for various nuclei values lying within limits of 0.10-0.16 Mev^{-1}. Theoretical appraisals lead to smaller scattering. Therefore, it is possible to think that scattering of experimental values, at least partially, is connected with experimental errors. During determination of mean values of $\frac{\partial \nu}{\partial E}$, it is expedient, basically, to be guided by measurements of ν made at neutron energy of 4-5 Mev [61-63]. At lower energies the measured effect is small and, furthermore, deviations from simple linear law are possible; on the other hand, at high energies there are possible certain deviations from simple linear law, connected with preliminary emission of neutrons.

The following values were accepted, which agree with changes occurring at the indicated energy, and do not contradict theoretical appraisals:

$$\text{for } U^{235} \text{and} Pu^{239} \frac{\partial \nu}{\partial E} = 0{,}130 \ \text{Mev}^{-1};$$

$$\text{for } U^{233} \text{and} Pu^{241} \frac{\partial \nu}{\partial E} = 0{,}135 \ \text{Mev}^{1}.$$

For reactors designs of important value is the knowledge of the energy dependence of ν in the region of relatively low energies of neutrons. In this region it is possible to expect deviation from the simple linear dependence. Actually, simple linear dependence of ν on neutron energy follows from the assumption about the constancy of kinetic energy of fission fragments. But this assumption is permissible only for those relatively high energies of virgin neutrons, at which there is high density (and overlap) of channels of fission. Constancy of kinetic energy of fragments in this energy band of neutrons was confirmed experimentally by Okolovich and others [64]. However, during change of energy of virgin neutrons from 0 to 1-2 Mev, for basic fissionable isotopes, apparently, there still occurs consecutive opening of channels of fission which are considerably separated in energy [55, 65-67].

Therefore, in this energy band it is possible, in principle, to expect certain irregular changes of kinetic energy of fragments, connected with the opening of new discrete channels of fission. According to this, it is possible to expect also deviations from linear dependence of ν. It is necessary to note that the opening of new channels of fission can be connected not only directly with the increase of energy of virgin neutrons, but also with the change occurring here in the role of neutrons with various angular moments. For instance, during the transition from fission of slow neutrons to fission of fast neutrons channels of fission excited by P-neutrons start to have influence.

Certain assumptions about the influence of channel effects on the change of kinetic energy of fragments and deviations from linear dependence are discussed in work [68].

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Experimental investigations of the considered deviations from the linear dependence of ν are connected with great difficulties and their results are still not fully reliable.

Meat and others [62] investigated the energy dependence of ν for U^{235} during the change of energy of virgin neutrons from 0.04 to 3 Mev and discovered deviations from linear law.

In work [67] are given measurements of ν for U^{235} during change of the energy of virgin neutrons from 0 to 1 Mev and similar deviations from linear law are revealed.

In this work are described measurements of changes of kinetic energy of fragments of fission according to which kinetic energy of fragments has a minimum at E_n = = 0.3 Mev, a small maximum near 0.7 Mev, and only higher energies maintains constant value, approximately equal to the value during fission of thermal neutrons. Recalculation of these data for ν leads to results agreeing with the above-mentioned measurements of ν(E).

In the table of constants of U^{235} for energies below ~1.5 Mev there was accepted the energy dependence of ν(E) following from totality of these results, but this dependence still cannot be considered fully established. For other fissionable isotopes there is less data. For U^{233} in the region of low energies there is accepted slower increase of ν with increase of energy of neutrons than follows from the linear dependence corresponding to values of ν at neutron energies of several Mev. (in reality, for U^{233} it is possible to expect even a certain decrease of ν in the region $E_n \sim 0.3$ Mev [67]).

For other isotopes the simple linear law is accepted.

Isotopes having fission threshold: Th^{232}, U^{234}, U^{236}, U^{238}, Pu^{240}, Pu^{242}. During selection of values of ν for U^{238}, Pu^{240}, and Th^{232}, we used Kuz'minov's measurements [69-71], and also results given in works [58, 72-74, 90]. Results of early measurements, in which calibration by U^{235} was used, were recalculated for the new value of ν for thermal fission of U^{235}.

For other isotopes the values of ν were selected on the basis of systematics worked out by Gordeyeva and Smirenkin [75].

The following values were accepted:

for $Th^{232}-\nu=1{,}96+0{,}140E_n$;
for $U^{234}-\nu=2{,}37+0{,}130E_n$;
for $U^{236}-\nu=2{,}38+0{,}135E_n$;
for $U^{238}-\nu=2{,}40+0{,}140E_n$;
for $Pu^{240}-\nu=2{,}80+0{,}130E_n$;
for $Pu^{242}-\nu=2{,}85+0{,}135E_n$.

§ 3. Neutron Fission Spectrum

Spectrum of neutrons appearing during fission of U^{235} thermal neutrons was measured by many authors [75-83].

Several simple analytic expressions have been offered, which describe well the form of this spectrum.

Of them it is possible to note the expression given in work [80]:

$$n(E)=C\exp\left(-\frac{E}{0{,}965}\right)\operatorname{sh}\sqrt{2{,}29E}$$

and a simpler one from work [56]:

$$n(E)=c\sqrt{E}\,e^{-\frac{E}{1{,}29}},$$

where E is energy of neutrons, Mev.

Both these expressions correspond very closely to forms of the spectrum. As a basis was accepted the first expression (mainly in order to preserve succession from earlier-used systems of constants). Fission spectra of other fissionable isotopes have been measured less accurately, but it is known that they differ little from the fission spectrum of U^{235} [42], 81, 82, 84]. For instance, comparison of the form of neutron fission spectrum for thermal fission of U^{235} and Pu^{239}, carried out with help of relative measurements with threshold detectors Kovalev and others [85], Grundl and others [86]), shows that the effective "temperature" entering in the utilized expression for the fission spectrum for Pu^{239} is 5 ± 1% higher than for U^{235}. Form of the spectrum of secondary neutrons depends also on energy of the neutrons provoking fission. Smirenkin [57, 87] compared, with the help of threshold detectors, the forms of the neutron fission spectra of U^{235} and Pu^{239} during fission of thermal and fast neutrons and found that the mentioned temperature is increased by 1 - 1.5% with increase of energy of the virgin neutrons by 1 Mev. Similar results are obtained during the analysis of form of the fission spectrum during fission of neutrons with energy of E = 14 Mev (after separation of preliminarily emitted neutrons)

[88]. Analysis of available data and theoretical considerations [56] show that there should be almost a one-to-one correspondence between form of neutron fission spectrum and average number of secondary neutrons. The basic factor disturbing the uniqueness of this conformity is the distinction between mean values of binding energies of neutrons in nuclei-fragments of different isotopes. But these distinctions are small. (They usually correspond to a distinction in the value of the number of secondary neutrons of not more than 0.1). In the tables are given values of ε_k, (i.e., fractions of separate groups in fission spectrum) depending upon average number of secondary neutrons. Values of ε_k pertaining to $\nu = 2.4$ correspond to thermal fission of U^{235}. They can be used in practice in all cases. If it is necessary to consider the distinction between the fission spectrum and the spectrum of neutrons during thermal fission of U^{235}, the following procedure is recommended. On the basis of preliminary multigroup calculation determine the mean value of ν during fission of the given isotope in the considered reactor system. Then, repeat calculation with new values of ε_k, corresponding to the earlier-obtained mean value of ν.

§ 4. Capture Cross Section

U^{233}, U^{235}, Pu^{239}. Radiative-capture cross section of neutrons for fissionable isotopes is usually given by the value of α — the ratio of capture cross section to fission cross section. Magnitude of α for epithermal and intermediate neutrons was determined from selector measurements of σ_t, σ_f and $\eta = \frac{\nu}{1 + \alpha}$ [9, 21-23, 25-27, 29, 92-95, 99-101, 135, 136, 141, 148-150, 324] and measurements for wide spectra ([96, 97] and others). Energy dependence of α for this region of energy was corrected per results of theoretical calculation performed by Usachev, Gordeyev, and others, proceeding from mean values of resonance parameters and a definite scheme of fission channels [68]. For the region of fast neutrons the results of works [102-105, 147] were used.

During the selection of values of α, greatest weight was given to the detailed measurements of Diven and Hopkins [105] (E_n = 0.03-1.0 Mev) and to the earlier measurements of Andreyev [103] for separate energy points (E_n-30, 220, and 900 kev).

The energy dependence of α ensuing from these measurements satisfactorily agrees with the results of the mentioned theoretical calculation. An exception is the very sharp drop of α for Pu^{239} during transition from E_n = 30 kev to E_n = 60 kev, noted in work [105], which is difficult to explain theoretically Therefore, for the energy band there was accepted somewhat less-sharp change of α than follows from work [105]. Comparison was made of mean values of α of Pu^{239} measured according to accumulation of Pu^{240} for the active zone of the experimental fast-neutron reactor BR-5 with results of calculation based on accepted group values of α [577]. Comparison shows satisfactory agreement of results.

For the center of the active zone: measured α was equal to 0.10 ± 0.03, while calculated α equalled 0.085.

For the edge of the active zone measured α was equal to 0.19 ± 0.02, while calculated α equalled 0.205.

$\underline{Pu^{241}}$. Values of α for $E_n < 10$ ev were selected according to results of selector measurements of σ_t and σ_f [21, 23, 40]. For higher groups of intermediate neutrons the values of α were estimated in accordance with average resonance parameters obtained by averaging characteristics of the lowest levels. These values were extrapolated into the region of fast neutrons by analogy with energy dependence of α for U^{233} (inasmuch as the Pu^{241} and U^{233} nuclei have identical values of spin and parity and similar values of average resonance parameters).

$\underline{U^{238} \text{ and } Th^{232}}$. Capture cross sections of neutrons for low-energy groups (for U^{238} $E_n < 1$ kev, for Th^{232} with $E < 0.5$ kev) was calculated from resonance parameters [116-122]. Selected group capture cross sections and values of coefficients of blocking were compared with results given in works [151-164, 289, 281, 287]. For the region of high energies there were used results from works [107, 108, 110, 113, 114, 181].

$\underline{U^{234}, U^{236}; Pu^{240}, Pu^{242}}$. For energies below 100 ev, capture cross section was determined from known resonance parameters [21, 22, 24, 165-174].

Capture cross sections of considered isotopes in region of fast neutrons have been studied little. Data is available for U^{236} [111, 112] and $\sigma_c Pu^{240}$ for the reactor spectrum [7]. Therefore, along with the indicated measurements semitheoretical appraisals were used. The value of spin and parity of nuclei of the considered even-even isotopes coincide with values for U^{238}.

In addition, the structure of levels of inelastic scattering for nuclei of these isotopes is close to the structure of levels of U^{238}. Therefore, during selection of values of capture cross section of these isotopes, it is possible to use an analogy with the arrangement of capture cross sections in U^{238} and Th^{232}. In the region o fast neutrons the ratios of capture cross sections of the considered isotopes (without taking into account competition of fission) must be close to ratios of quantities $(\Gamma_\gamma \rho)$ (Γ_γ – average radiation width; ρ – density of levels). With decrease energy the ratios of capture cross sections must be close to values of $(\Gamma_n \rho)$, for which it is possible to expect smaller distinctions. (Γ_n – average neutron width of levels). Density ratio of levels of considered nuclei can be determined from average distances between known lower levels. But, since the number of levels in this case is small, such method can be not fully reliable. Therefore, we used the ratio of density of levels from statistical theory on the basis of values of binding energies of neutrons.

Non-Fissionable Elements

For low-energy groups the capture cross section was determined from thermal value [21] and resonance parameters of known levels [21, 22]. In most cases the thermal section was extrapolated according to the 1/v law up to the energy of first resonance (with the exception of those cases when the existence of a close connected level was well established). During determination of capture cross section from resonance parameters, there frequently arises difficulty, connected with the fact that for many isotopes there are no measurements of Γ_γ. In these cases values of Γ_γ were selected by systematization of radiation widths of isotopes with similar atomic weight and of numbers of neutrons and protons identical in parity. In certain cases such selection can be corrected on the basis of measurements of the resonance integral of the capture cross section [22]. Unfortunately, measurements of small resonance integrals, carried out by various authors, in many cases give strongly differing results. In these cases little value is attached to them. It is necessary to note that determination of radiative capture cross sections in the region of first resonance levels still remains very unreliable. Sometimes it is impossible to exclude the possibility of error, even of the order of magnitude of the cross section. Such unsatisfactory situation is connected with the fact that levels with small value of neutron width cannot be detected during measurement of total cross section, but at the same time can make an essential contribution to the capture cross section. In order to consdier this, in certain cases capture cross sections calculated from resonance parameters of known levels were artificially increased, proceeding from appraisal of possible density of levels, weak in contribution to the total cross section.

For higher groups of intermediate neutrons ($E_n \sim 0.1$-10 kev) there were used results of the works of Shapiro and colleagues [175-178] Gibbons [179], Neiler [180], and others.

During the use of data from these works, where it was possible, correctives were introduced for resonance self-shielding. For the region of fast neutrons we used the results of works [181-196].

In those cases when for certain isotopes of the considered element the capture cross section had not been measured, it was estimated in accordance with average resonance parameters or was selected by analogy with neighboring isotopes (with correction for difference of binding energies and parity of nucleons).

It is necessary to note that capture cross sections given in the tables include cross sections of threshold reactions (n, p) (n, α), and so forth.

If measurements were lacking, these cross sections were estimated on the basis of energy thresholds of reactions. Below are enumerated the basic works used during selection of capture cross sections of separate elements:

Li — [21, 175, 177, 198—207, 287]; Be — [21, 144, 175, 209—214]; B — [21, 175, 177, 197, 198, 209, 211, 213, 216—219, 294]; C — [179, 180, 213, 220—222]; N — [21, 177, 197, 198, 210, 224, 225]; O — [21, 210, 211, 213, 223, 224, 226, 228, 229]; Na — [21, 109, 113, 121, 181, 189, 193, 194, 210, 211, 223, 230—232, 239—245, 285, 287, 578]; Mg — [21, 109, 113, 157, 179—182, 193, 210, 211, 223, 232, 246—248, 250, 251, 287, 556, 558, 578]; Al — [19, 21, 109, 113, 157, 179, 180—182, 189, 193, 210, 211, 223, 230—233, 245, 247—250, 252—254, 256, 268, 287, 556, 560, 578]; Si — [21, 113, 179—181, 189, 210, 211, 223, 232, 234, 246, 248, 251, 287, 365, 558, 578]; K — [109, 113, 181, 189, 193, 197, 223, 230, 232, 234, 237, 270, 271, 272, 287, 571]; Ca — [182, 192, 221, 232, 246, 273, 276, 277, 287, 572, 578]; Ti — [109, 113, 192, 193, 196, 197, 211, 223, 230, 232, 246, 256, 257, 265, 276, 277—280, 287, 365, 574, 578]; V — [21, 109, 157, 179, 180, 181, 188, 189, 193, 195, 197, 211, 223, 232, 245, 252, 253, 262, 271, 282—284, 287, 290, 578]; Cr — [179—182, 186, 192, 197, 223, 231, 248, 273, 276, 277, 283, 287, 323, 365, 578]; Fe — [18, 19, 21, 114, 157, 176, 177, 179—183, 192, 197, 210, 211, 223, 233, 246—250, 254, 258—261, 266, 273, 276—277, 287, 290, 296, 297, 302, 305, 306, 323, 365, 556, 560, 578]; Ni — [19, 114, 179—183, 189, 192, 197, 211, 223, 227, 232—234, 247, 249—251, 261, 269, 271, 277, 287, 302—304, 307, 557, 578]; Cu — [19, 21, 109, 110, 113, 157, 179—182, 189, 190, 192—197, 211, 231, 232, 234, 236, 245, 247, 249, 250, 252—257, 260, 261, 271, 278—282, 283, 287, 290, 296, 300, 556, 558, 578]; Zr — [19, 109, 113, 114, 157, 158, 179—181, 190, 192—194, 197, 223, 246, 250, 251, 279, 282, 287, 295, 299, 308, 311, 318, 578]; Nb — [19, 21, 114, 178—181, 183, 188, 189, 192, 211, 232, 245, 282, 287, 295, 311, 315]; Mo — [19, 21, 109, 114, 157, 179, 180, 181, 187, 189, 191—197, 211, 223, 227, 232, 234, 236, 253, 256, 278, 287, 289, 295, 312, 314, 316, 365, 578]; Ta — [21, 119, 120, 157, 179—181, 192, 197, 211, 232, 234, 238, 245, 287, 289, 312, 314, 321]; W — [21, 109, 113, 157, 179—182, 188, 189, 191--197, 232, 234, 245, 255, 278, 286, 287, 298, 309, 310, 317, 319, 365, 559]; Re — [109, 119, 180, 193, 232, 245, 287, 310]; Pb — [19, 113, 157, 177, 179—182, 192, 221, 223, 230, 232, 275, 277, 287—289, 297, 300, 301, 320, 310]; Bi — [19, 113, 157, 179—181, 192, 223, 230—232, 234, 250, 257, 269, 274, 287, 298, 310].

Fragments

In the tables are given total cross sections of poison fragments. Values of cross sections are standardized for a pair of fragments.

To poison fragments [1, 4] are referred stable or long-lived ($T_{1/2} > 10$-100 days) fragments, thermal cross sections of which do not exceed 10^3 barn. (From every radioactive chain there was considered one isotope). Thus, the number of poison fragments did not include the following stable or long-lived fragments, thermal cross section of which exceeds 10^3 barn: Cd^{113}, Sm^{149}, Sm^{151}, Gd^{155}, Gd^{157}.

It is necessary to note that cross sections of these fragments were not considered only in the region of slow neutrons ($E_n < 160$ ev). For higher groups the given cross sections pertain to all stable and long-lived fragments. Total yield of the enumerated stable and long-lived poisoner fragments is composed, in all, of several percents of the total number of fragments. Cross sections in the region of fast and hard intermediate neutrons do not have such scattering as in the region of slow neutrons; therefore, the exclusion of poisoner fragments, practically, (taking into account accuracy of available information) does not change the appraisal of cross section of fragments for the region of fast and hard intermediate neutrons.

During selection of capture cross sections of fragments, there were used works [325-328], and also new data on resonance parameters, capture cross sections and yields of separate fragments.

§ 5. Inelastic Scattering

General Remarks

As it is known, the character of inelastic scattering of neutrons is determined by the structure of levels of considered nuclei (meant here are levels of target nuclei). It is possible to separate two regions of neutron energy. In the first, during inelastic scattering of neutrons, a small number of levels of target nuclei is excited. Here, the spectrum of inelastically-scattered neutrons consists of separate lines, corresponding to excitation of separate levels, and during the determination of group constants, the excitation of separate levels must be considered individually. At higher neutron energies (corresponding to the second region) during inelastic scattering, there can be excited a large number of levels and the spectrum of inelastically scattered neutrons assumes continuous character. It is necessary to note that the separation of two energy bands has, to a certain degree, conditional character. The spectrum of inelastically scattered neutrons must usually be considered continuous when it is not possible to experimentally break it down into separate lines, although the true overlap of lines sets in at somewhat higher energies. The position of the boundary between the two regions depends on the individual properties of the nuclei, but on the average it is changed monotonically with change of atomic weight, (with the exception of the "magic" nuclei, for which this boundary is disposed at higher energies than for neighboring nuclei).

For the majority of the considered light nuclei ($A < 18$) the mentioned boundary is disposed at $E_n > 7\text{-}10$ Mev, and, consequently, in practice, at all energies interesting us there is scattering with excitation of separate levels. For nuclei with average atomic weight ($A \approx 20\text{-}150$) the cut-off energy drops to 3-6 Mev, and for heavier nuclei it drops to 1-3 Mev.

During determination of group constants of inelastic scattering, in the first energy band there were used results of works, in which were applied different methods of separation of groups of inelastically-scattered neutrons:

a) with help of spectrometric ionization chambers, including chambers with He^3 (Batchelor [342], Abramov [414, 465], Glazkov [407-466], Popov [343], and others);

b) by analysis of tracks of recoil protons on photographic plates Sal'nikov [344], Weddell and others [371], and others);

c) with help of time-of-flight spectrometry (Cranberg and Levin [335], Cranberg [368], Batchelor [417], Sukhanov and Rukavishnikov [430], and others). In addition, results were used of investigation of excitation of separate levels by measurement of energies and yields of γ-rays appearing during inelastic scattering (Day [336], Day and Lind [431, 441], Androsenko, Broder, and Lashuk [425, 427], and Broder and others [423]. The last investigations usually give the most detailed information about inelastic scattering, although in certain cases it is not entirely simple, owing to the difficulty of deciphering of cascade γ-transitions. For elements (Mg, Si, Ca, Ti, V, Fe, Mo, Ta, W, Re, Pb, U^{233}, U^{235}, U^{238}, Pu^{239}) besides experimental data there were brought in results of theoretical calculations (Kolesov and Stavinskiy [494], Gordeyev and Bazazyants [468], Kardashev and others [424], Moldauer [115]), founded on the assumption that inelastic scattering passes through a stage of formation of the compound nucleus [470]. Here, there were used penetration values calculated from an optical model of the nucleus with blurred edge Yermakov, Kolesov, and Marchuk [486]. Information necessary for calculation about the position and characteristics of levels were taken from the collection of Dzhelepov and Peker [412], the supplement to this collection [413], and from other works. Results of calculations were corrected in accordance with available experimental points. When only information about location, but not about characteristics of levels was available for elements, this information was also considered during "resolute" assignment of matrices of inelastic transitions. For light elements a certain idea about the relative role of excitation of separate levels can be obtained from measurements of the inelastic scattering of protons [471].

For elements with low atomic weight, during determination of the energy of a neutron scattered with excitation of defined levels nuclear recoil, which leads to dependence of energy on scattering angle was considered. Here, it was assumed that a nucleus emitting a secondary neutron is not able to slow down in a substance.

For the second energy band (the region of "continuous" spectra) there was used treatment of experimental data in accordance with statistical theory.

For this energy band simplified statistical theory leads to the following form of spectrum of inelastically scattered neutrons:

$$n(E) = Ee^{-\frac{E}{T}},$$

where T is effective temperature. This simple form is approximate and does not consider many known factors (in it is preserved only the first member of expansion of a more exact expression, energy dependence of the cross section of formation of the compound nucleus is not considered, during its derivation, no distinction is made between neutrons with various angular moment the possibility of "direct" processes is not considered, etc.). Nonetheless, we took as a basis the given simple form, inasmuch as this was the one used during the processing of data in majority of experimental works. But in order to consider the possiblity of influence of the noted factors, to the form of the spectrum given by this expression we introduced individual corrections (different for different nuclei). Values of effective temperature, where this was possible, were selected from results of experimental measurements, while for other cases they were selected on the basis of systematics of dependence of effective temperature on atomic weight and energy of virgin neutrons. For instance, for $E_0 = 7$ Mev the accepted values of temperature are changed from ~0.1 Mev (for light nuclei) to ~0.45 Mev (for heavy nuclei) [472]. Dependence of the accepted values of T_{eff} on energy of the virgin neutrons is close to $T_{eff} \sim E^{(0.3-0.6)}$

The high-energy part of the thus-obtained spectrum was corrected to account for the structure of low levels of the considered element. For instance, if the considered element has no low levels, then neutron spectrum obtained on the basis of simplified statistical consideration was artificially broken away in its upper part. And, conversely, if the considered element has low levels, which with great probability are excited when virgin neutrons have high energy, this was considered by proper raising of the high-energy part of the spectrum of inelastically-scattered neutrons.

In other words, in the last case the combined approach was used: individual calculation of low levels and statistical calculation of high levels whose energy is close to energy of virgin neutrons. Furthermore, matrices of inelastic transitions, obtained on the basis of statistical consideration, were corrected to account for results of measurements of "withdrawal sections," made with threshold indicators. Basically, results were used of measurements in which as threshold indicator the fission chamber with U^{238} was applied (Andreyov, Bondarenko, Lovchikova [51, 441-443], Bethe, Beyster, Carter [351, 361*]). Effective threshold of this reaction ($E_{ff} \approx 1.4$ Mev) coincides with boundary of one of the groups. Values of the inelastic scattering cross section given in the tables (see Chapter 1) include reaction cross section (n, 2n). Therefore, the sum of given sections of inelastic transitions can exceed the group value of the inelastic scattering cross section. Of the light elements the reaction (n, 2n) was considered for deuterium and beryllium, for which there was taken $\sigma(n, 2n) = \sigma_{in}$. For heavy elements the spectrum (first and second) neutrons from reaction (n, 2n) was estimated in accordance with statistical theory. In the absence of measurements, the reaction cross sections (n, 2n) were estimated on the basis of the energy threshold. Given inelastic scattering cross sections also include cross sections of all other reactions accompanied by escape of secondary neutrons (in addition to fission). An example of this is the reaction (n, d) on

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*Recent data of Beyster and Carter are given in work [362].

Li^6, which leads to formation of Li^5, emitting the secondary neutron [200]. During calculation of mean cosines of angles of inelastic scattering, provoking transitions between groups (which are given for elements with $A < 20$), angular distribution of inelastically-scattered neutrons was taken as isotropic in the center-of-mass system. (With the exception of upper groups, in which to account for the possibility of "direct" interactions there was assumed a certain anisotropy in the center-of-mass system, corresponding to the mean value of the cosine of scattering angle 0.1-0.2). Below are enumerated the basic works which we used during selection of cross sections of inelastic transitions, and additional explanations are given for certain cases.

Fissionable Elements

U^{233}, U^{235}, Pu^{239} – [46, 330, 362, 368, 375, 411-413, 432, 462, 468, 475, 476, 562].

For energies below 450 kev are used the results of the enumerated calculations, corrected according to Cranberg's data [368]. For groups with $E_n > 1.4$ Mev we used the statistical form of spectrum with effective temperature, just as for U^{238} (see below). However, upper parts of the thus-obtained spectra were overstated for best agreement with results of measurements of "the withdrawal section" near the fission threshold of U^{238} [51, 411, 362].

U^{238} – [46, 51, 58, 330, 335, 339, 342, 362, 368, 375, 406, 407, 412, 428, 432, 440, 462, 466, 477, 478, 482, 485, 493, 494, 498].

Considered were levels with E equal to 45, 145, and 310 kev, and groups of levels in the region of 0.7, 1 and 1.25 Mev. Inelastic scattering on these levels and groups of levels was considered up to an energy of 2 Mev. But at the same time it was taken that from $E_n = 1.4$ Mev there begins a rapid increase of density of levels and, accordingly, there appears soft group of neutrons with continuous spectrum, which passes into the statistical range for $E_n > 2.0$ Mev. Values of effective temperature were selected according to data of Cranberg and Levin [335], Fetisov [406], Zamyatnin and others [462], and other works, and were accepted as equal to: for E_n of 2.5, 4, and 7 Mev, T_{eff} is equal to 0.3, 0.4, and 0.5, respectively.

Matrices of inelastic transitions obtained on the basis of given values of temperatures were corrected in such a way that their use led to correct value of total number of fissions in an infinite block of U^{238}. On the basis of measurements by Nikolayev, Golubev, and Bondarenko [50, 51], it was taken that one fission neutron (fission of U^{235} by slow neutrons) in an infinite block of U^{238} causes, on the average, 0.17 fissions.

$\underline{Th^{232}}$ – [58, 333, 401, 412, 417, 462, 466-478, 493]. Considered were levels where E equals 50, 170, 330 kev, and group of levels in the E-region, equal to 0.8, 1.1, 1.4, and 1.6 Mev. Corrected statistical form of spectrum was taken for $E_n > 3$ Mev.

$\underline{U^{234}, U^{236}, Pu^{240}, Pu^{242}}$. Cross sections of inelastic transitions were selected by analogy with U^{238} and Th^{232} with approximate allowance for certain changes in the position of lowest levels [412].

Non-Fissionable Elements

D — [479, 554]; Li — [200, 387, 391, 398, 481, 495, 471]; Be — [330, 331, 334, 336, 345, 346, 354, 364, 386, 391, 392, 393, 398, 410, 428, 444, 446, 448, 479, 488, 495, 554, 471, 563].

It was taken that $\sigma_{in} = \sigma(n, 2n)$, although exact equality of these cross sections has been established experimentally with insufficient accuracy. Reaction (n 2n) on beryllium can occur:

a) during excitation of level of beryllium at E = 2.43 Mev with subsequent emission of a secondary neutron;

b) during straight breakup of the compound nucleus into three or four parts with simultaneous emission of two neutrons;

c) during excitation of higher levels (basically, apparently, of the level with $E_n = 6.76$Mev) with subsequent emission of a secondary neutron (basically, through breakup of the system into one neutron and two α-particles).

Experimental information about the relative role of these processes is contradictory. It was taken that at low energies more than half of the cross section is explained by the first process, the share of which gradually decreases with increase of energy of the virgin neutron.

It is possible to note that the different possibilities mentioned lead to almost identical values of average energy of secondary neutrons. (Distinction between values of average energy of secondary neutrons is connected only with recoil energy of nuclei and energy of breakup of Be^8, which are small.)

B — [336, 346, 349, 354, 369, 386, 391, 393, 398, 425, 431, 441, 471]; **C** — [330, 331, 334, 336, 340, 346, 354, 349, 350, 358, 360, 371, 373, 380, 385, 386, 391—394, 398—400, 410, 418, 419, 425, 426, 435, 436, 444, 445—471, 495, 496, 379]; **N** — [336, 349, 386, 400, 419, 435, 455, 471, 495]; **O** — [336, 385, 386, 426, 434, 435, 471, 495]; **Na** — [51, 335, 338, 340, 388, 395, 396, 399, 407, 425, 430, 441—443, 454, 457, 473]; **Mg** — [335, 336, 340, 348, 354, 376, 386, 392—395, 398, 416, 422, 425, 426, 437, 444, 491, 473, 489]; **Al** — [330, 331, 334—336, 338, 340, 346, 349—351, 354, 356, 357, 360, 361, 369, 380—382, 385, 386, 389, 392—395, 398—402, 407, 416, 425, 426, 432, 437, 444, 459, 473, 496]; **Si** — [356, 386, 401, 415, 425, 426, 441, 459, 473]; **K** — [401, 441, 442, 443, 473]; **Ca** — [330, 334, 336, 340, 357, 358, 386, 395, 401, 426, 473, 487]; **Ti** — [330, 331, 333—335, 351, 354, 393, 427, 444, 458]; **V** — [335, 347, 351, 354, 467]; **Cr** — [334, 335, 340, 344, 345, 347, 353, 354, 357, 367, 372, 389, 395, 414, 427, 434, 467]; **Fe** — [51, 330, 331, 333—338, 340, 343—346, 349—356, 358—361, 363, 367, 369, 371, 379, 381, 383, 384, 386, 389, 390, 393—395, 398—400, 402, 407, 409, 414, 416, 422—426, 429—433, 437, 339, 440, 443, 444, 450, 451, 458, 460, 483, 485, 490, 493]; **Ni** — [330, 331, 333—336, 340, 346, 351, 354, 359, 361, 367, 382, 385, 389, 393—395, 407, 414, 423, 425, 430, 493]; **Cu** — [51, 330, 331, 333—336, 338, 340, 343, 345, 346, 349—351, 354, 360, 361, 380 485, 386, 392—395, 398, 407, 416, 421, 425, 432, 440, 444, 450, 466, 499, 500]; **Zr** — [330, 331, 333, 335, 351, 354, 358, 361, 369, 374, 392, 393, 399, 404, 425, 441, 444, 447, 451, 493]; **Nb** — [333, 354, 414, 420, 423, 425, 443, 449, 453, 456, 466]; **Mo** — [333, 335, 340, 354, 395, 398, 414, 425, 440, 442, 443, 461, 466]; **Ta** — [330, 332, 333, 336, 341, 346, 354, 364, 366, 425, 433, 441, 452, 492]; **W** — [51, 58, 330—333, 340, 341, 346, 351, 361, 378, 382, 386, 393—395, 398, 407, 427, 433, 466]; **Re** — [341]; **Pb** — [51, 330, 331, 333—336, 340, 343, 344, 349, 350, 351, 354, 359, 360, 361, 367, 369, 377, 380, 385, 386, 389, 393—395, 397—400, 402, 403, 407, 421, 422, 425, 429, 430, 432, 438, 439, 440, 441, 444, 451, 463, 484, 485, 493, 496, 346]; **Bi** — [46, 51, 331, 333—336, 340, 343, 349—351, 353, 354, 357, 360, 361, 364, 367, 377, 382, 386, 389, 392, 393—395, 397—400, 407, 415, 420, 421, 427, 437, 438, 440, 444, 451, 483, 330].

§ 6. Angular distribution of Elastic Scattering

For determination of angular distribution of elastic scattering, basically, are used results of measurements made with monoenergetic neutrons.

For intermediate energies, anisotropy of scattering was determined by interpolation of values of μ_e.

With decrease of energy the value of μ_e aspired to that for isotropy in the center-of-mass system:

$$\mu_e = \frac{2}{3A}.$$

If measurements were absent, angular distribution was estimated by analogy with neighboring elements or in accordance with calculated data.

Special difficulties are caused by group averaging of angular distribution of scattering for certain light elements, which have low (but still noticeable) density of levels of the compound nucleus in that energy band where considerable anisotropy is observed in the center-of-mass system.

For these elements angular distribution of scattering depends on energy of very irregular form, that makes unreliable the interpolation of data pertaining to separate energy points.

In these cases, besides results of measurements with monoenergetic neutrons, results were used of measurements of angular distributions with help of threshold detectors and source of neutron fission [516, 530].

Below are enumerated basic works:

H — [480]; **D** — [480, 502, 506, 510, 532]; **Li** — [503, 516, 530, 547]; **Be** — [330, 346, 446, 503—505, 508, 516, 533, 546, 550]; **B** — [346, 504, 516, 533]; **C** — [330, 346, 408, 503—505, 508, 516, 527, 533, 534, 541—544, 549, 550]; **N** — [516, 527, 548]; **O** — [58, 503, 515, 516, 534—539, 549, 553]; **Na** — [504, 509, 516]; **Mg** — [504, 513, 514, 516, 518, 540, 576]; **Al** — [330, 346, 401, 408, 459, 504, 505, 508, 511—517, 524, 525, 531, 549]; **Si** — [401, 503, 515, 516]; **K** — [401, 504, 516]; **Ca** — [401, 503, 518; **Ti** — [333, 335, 504, 505, 511]; **V** — [504]; **Cr** — [344, 504, 508]; **Fe** — [58, 330, 333, 335, 343, 344, 346, 408, 439, 504, 505, 508, 512, 517, 519, 523, 524, 526, 549, 552]; **Ni** — [333, 346, 504, 508, 514, 515, 519, 545, 549]; **Cu** — [333, 343, 346, 408, 503, 504, 514, 519, 525, 530, 549, 551, 552]; **Zr** — [330, 333, 504, 505, 507, 525, 545]; **Nb** — [333, 504, 507]; **Mo** — [333, 504, 507, 527, 545, 549]; **Ta** — [330, 333, 346, 504, 505, 518, 520, 523]; **W** — [58, 333, 346, 504, 505, 549]; **Pb** — [333, 343, 344, 346, 408, 439, 503—505, 512, 514, 517, 521, 522, 524, 526, 529, 531, 549, 551]; **Bi** — [330, 333, 343, 504, 505, 512, 514, 518, 523, 524, 528, 529, 531]; **Th^{232}**— [333, 401, 504, 520, 530, 575]; **U^{235}** — [46, 368, 375]; **U^{238}** — [46, 368, 375, 408, 498, 503, 504, 520, 530, 551]; **Pu^{239}**— [46, 368, 375].

CHAPTER III

TABLES OF GROUP CONSTANTS

Neutron Fission Spectra

KEY: при = where; равном, равной = equal to; *Мэв* = Mev; *кэв* = kev; *эв* = ev.

i	E_n	Δu	s_i при ν, равном				
			2,4	2,6	2,8	3,0	3,2
1	6,5—10,5 *Мэв*	0,48	0,016	0,017	0,018	0,020	0,021
2	4,0—6,5 *Мэв*	0,48	0,088	0,092	0,095	0,098	0,101
3	2,5—4,0 *Мэв*	0,48	0,184	0,186	0,188	0,190	0,192
4	1,4—2,5 *Мэв*	0,57	0,270	0,270	0,269	0,268	0,267
5	0,8—1,4 *Мэв*	0,57	0,202	0,200	0,198	0,196	0,194
6	0,4—0,8 *Мэв*	0,69	0,141	0,139	0,137	0,135	0,133
7	0,2—0,4 *Мэв*	0,69	0,061	0,060	0,059	0,058	0,057
8	0,1—0,2 *Мэв*	0,69	0,024	0,023	0,023	0,022	0,022
9	46,5—100 *кэв*	0,77	0,010	0,009	0,009	0,009	0,009
10	21,5—46,5 *кэв*	0,77	0,003	0,003	0,003	0,003	0,003
11	10,0—21,5 *кэв*	0,77	0,001	0,001	0,001	0,001	0,001

Hydrogen (H)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{tr}(e)$
1	6,5—10,5 *Мэв*	0,48	1,20	0,000	0,00	1,20	0,667	1,00	1,04
2	4,0—6,5 *Мэв*	0,48	1,65	0,000	—	1,65	0,667	1,00	1,36
3	2,5—4,0 *Мэв*	0,48	2,20	0,000	—	2,20	0,667	1,00	1,74
4	1,4—2,5 *Мэв*	0,57	3,00	0,000	—	3,00	0,667	1,00	2,28
5	0,8—1,4 *Мэв*	0,57	4.10	0,000	—	4,10	0,667	1,00	3,12
6	0,4—0,8 *Мэв*	0,69	5,70	0,000	—	5,70	0,667	1,00	4,13
7	0,2—0,4 *Мэв*	0,69	8,10	0,000	—	8,10	0,667	1,00	5,87
8	0,1—0,2 *Мэв*	0,69	11,0	0,000	—	11,0	0,667	1,00	7,97
9	46,5—100 *кэв*	0,77	14,0	0,000	—	14,0	0,667	1,00	9,77
10	21,5—46,5 *кэв*	0,77	16,6	0,000	—	16,6	0,667	1,00	11,6
11	10,0—21,5 *кэв*	0,77	18,5	0,000	—	18,5	0,667	1,00	12,9
12	4,65—10,0 *кэв*	0,77	19,3	0,000	—	19,3	0,667	1,00	13,5
13	2,15—4,65 *кэв*	0,77	19,7	0,001	—	19,7	0,667	1,00	13,8
14	1,0—2,15 *кэв*	0,77	20,0	0,001	—	20,0	0,667	1,00	14,0
15	465—1000 *эв*	0,77	20,1	0,002	—	20,1	0,667	1,00	14,0
16	215—465 *эв*	0,77	20,2	0,003	—	20,2	0,667	1,00	14,1

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_s	μ_s	ξ	$\sigma_{э}(e)$
17	100—215 эв	0,77	20,2	0,004	—	20,2	0,667	1,00	14,1
18	46,5—100 эв	0,77	20,3	0,006	—	20,3	0,667	1,00	14,2
19	21,5—46,5 эв	0,77	20,3	0,009	—	20,3	0,667	1,00	14,2
20	10,0—21,5 эв	0,77	20,3	0,014	—	20,3	0,667	1,00	14,2
21	4,65—10 эв	0,77	20,3	0,020	—	20,3	0,667	1,00	14,2
22	2,15—4,65 эв	0,77	20,3	0,030	—	20,3	0,667	1,00	14,2
23	1,0—2,15 эв	0,77	20,3	0,044	—	20,3	0,667	1,00	14,2
24	0,465—1,0 эв	0,77	20,4	0,064	—	20,3	0,667	1,00	14,2
25	0,215—0,465 эв	0,77	20,4	0,093	—	20,3	0,667	1,00	14,2
T	0,0252 эв		20,6	0,332	—	20,3	0,667	—	—

i	$\sigma_s(i, i+k)$ при k, равном										
	0	1	2	3	4	5	6	7	8	9	10
1	0,160	0,400	0,240	0,176	0,096	0,064	0,032	0,016	0,009	0,004	0,003
2	0,287	0,512	0,375	0,205	0,136	0,068	0,034	0,018	0,008	0,004	0,003
3	0,457	0,767	0,418	0,279	0,139	0,070	0,037	0,018	0,009	0,004	0,002
4	0,725	0,975	0,650	0,325	0,163	0,087	0,040	0,019	0,009	0,004	0,003
5	0,984	1,558	0,779	0,389	0,209	0,097	0,045	0,021	0,010	0,004	0,004
6	1,570	2,065	1,033	0,553	0,257	0,119	0,055	0,026	0,012	0,006	0,004
7	2,231	2,936	1,572	0,732	0,338	0,157	0,073	0,034	0,016	0,007	0,004
8	3,029	4,270	1,984	0,919	0,427	0,199	0,092	0,043	0,020	0,009	0,008
9	4,227	5,238	2,430	1,128	0,524	0,243	0,113	0,052	0,024	0,011	0,010
10	5,012	6,210	2,882	1,338	0,621	0,288	0,134	0,062	0,029	0,013	0,011
11	5,585	6,921	3,212	1,491	0,692	0,321	0,149	0,069	0,032	0,015	0,013
12	5,827	7,220	3,350	1,556	0,722	0,335	0,156	0,072	0,033	0,016	0,013
13	5,947	7,369	3,420	1,588	0,737	0,342	0,159	0,074	0,034	0,016	0,014
14	6,038	7,462	3,472	1,612	0,748	0,347	0,161	0,075	0,035	0,016	0,014
15	6,068	7,520	3,489	1,620	0,752	0,349	0,162	0,075	0,035	0,016	0,014
16	6,098	7,557	3,506	1,628	0,756	0,351	0,163	0,076	0,035	0,016	0,014
17	6,098	7,557	3,506	1,628	0,756	0,351	0,163	0,076	0,035	0,030	—
18	6,129	7,594	3,524	1,636	0,759	0,352	0,164	0,076	0,066	—	—
19	6,129	7,594	3,524	1,636	0,759	0,352	0,164	0,142	—	—	—
20	6,129	7,594	3,524	1,636	0,759	0,352	0,306	—	—	—	—
21	6,129	7,594	3,524	1,636	0,759	0,658	—	—	—	—	—
22	6,129	7,594	3,524	1,636	1,417	—	—	—	—	—	—
23	6,129	7,594	3,524	3,053	—	—	—	—	—	—	—
24	6,129	7,594	6,577	—	—	—	—	—	—	—	—
25	6,129	14,171	—	—	—	—	—	—	—	—	—

i	$\mu_s(i, i+k)$ при k, равном										
	0	1	2	3	4	5	6	7	8	9	10
1	0,942	0,839	0,660	0,511	0,384	0,283	0,200	0,142	0,099	0,068	0,036
2	0,938	0,822	0,636	0,478	0,352	0,249	0,176	0,123	0,084	0,057	0,033
3	0,930	0,789	0,593	0,437	0,309	0,219	0,152	0,104	0,071	0,048	0,032
4	0,917	0,778	0,573	0,405	0,287	0,200	0,137	0,092	0,064	0,043	0,028
5	0,912	0,761	0,538	0,381	0,266	0,182	0,123	0,084	0,058	0,039	0,018
6	0,909	0,743	0,525	0,366	0,251	0,164	0,116	0,079	0,054	0,037	0,015

l	$\mu_e(l, l+k)$ при k, равном										
	0	1	2	3	4	5	6	7	8	9	10
7	0,909	0,743	0,518	0,355	0,240	0,164	0,112	0,076	0,062	0,035	0,011
8	0,909	0,733	0,501	0,339	0,232	0,158	0,107	0,073	0,050	0,034	0,007
9	0,897	0,724	0,493	0,336	0,229	0,156	0,106	0,072	0,049	0,034	0,006
10	0,897	0,724	0,493	0,336	0,229	0,156	0,106	0,072	0,049	0,034	0,006
11	0,897	0,724	0,493	0,336	0,229	0,156	0,106	0,072	0,049	0,034	0,006
12	0,897	0,724	0,493	0,336	0,229	0,156	0,106	0,072	0,049	0,034	0,006
13	0,897	0,724	0,493	0,336	0,229	0,156	0,106	0,072	0,049	0,034	0,006
14	0,897	0,724	0,493	0,336	0,229	0,156	0,106	0,072	0,049	0,034	0,006
15	0,897	0,724	0,493	0,336	0,229	0,156	0,106	0,072	0,049	0,034	0,006
16	0,897	0,724	0,493	0,336	0,229	0,156	0,106	0,072	0,049	0,034	0,006
17	0,897	0,724	0,493	0,336	0,229	0,156	0,106	0,072	0,049	0,012	—
18	0,897	0,724	0,493	0,336	0,229	0,156	0,106	0,072	0,032	—	—
19	0,897	0,724	0,493	0,336	0,229	0,156	0,106	0,054	—	—	—
20	0,897	0,724	0,493	0,336	0,229	0,156	0,088	—	—	—	—
21	0,897	0,724	0,493	0,336	0,229	0,121	—	—	—	—	—
22	0,897	0,724	0,493	0,336	0,179	—	—	—	—	—	—
23	0,897	0,724	0,493	0,263	—	—	—	—	—	—	—
24	0,897	0,724	0,386	—	—	—	—	—	—	—	—
25	0,897	0,567	—	—	—	—	—	—	—	—	—

Deuterium (D)

l	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_s(e)$
1	6,5—10,5 *Мэв*	0,48	1,28	0,0000	0,11	1,17	0,46	0,59	0,80
2	4,0—6,5 *Мэв*	0,48	1,70	0,0000	0,04	1,66	0,41	0,64	1,07
3	2,5—4,0 *Мэв*	0,48	2,15	0,0000	0,00	2,15	0,33	0,73	1,50
4	1,4—2,5 *Мэв*	0,57	2,60	0,0000	—	2,60	0,29	0,77	1,85
5	0,8—1,4 *Мэв*	0,57	2,90	0,0000	—	2,90	0,26	0,80	2,23
6	0,4—0,8 *Мэв*	0,69	3,10	0,0000	—	3,10	0,25	0,82	2,33
7	0,2—0,4 *Мэв*	0,69	3,20	0,0000	—	3,20	0,26	0,80	2,41
8	0,1—0,2 *Мэв*	0,69	3,30	0,0000	—	3,30	0,27	0,79	2,44
9	46,5—100 *кэв*	0,77	3,40	0,0000	—	3,40	0,32	0,74	2,28
10	21,5—46,5 *кэв*	0,77	3,40	0,0000	—	3,40	0,33	0,72	2,23
11	10,0—21,5 *кэв*	0,77	3,40	0,0000	—	3,40	0,33	0,72	2,23
12	4,65—10,0 *кэв*	0,77	3,40	0,0000	—	3,40	0,33	0,72	2,23
13	2,15—4,65 *кэв*	0,77	3,40	0,0000	—	3,40	0,33	0,72	2,23
14	1,0—2,15 *кэв*	0,77	3,40	0,0000	—	3,40	0,33	0,72	2,23
15	465—1000 *эв*	0,77	3,40	0,0000	—	3,40	0,33	0,72	2,23
16	215—465 *эв*	0,77	3,40	0,0000	—	3,40	0,33	0,72	2,23
17	100—215 *эв*	0,77	3,40	0,0000	—	3,40	0,33	0,72	2,23
18	46,5—100 *эв*	0,77	3,40	0,0000	—	3,40	0,33	0,72	2,23
19	21,5—46,5 *эв*	0,77	3,40	0,0000	—	3,40	0,33	0,72	2,23
20	10,0—21,5 *эв*	0,77	3,40	0,0000	—	3,40	0,33	0,72	2,23
21	4,65—10 *эв*	0,77	3,40	0,0000	—	3,40	0,33	0,72	2,23
22	2,15—4,65 *эв*	0,77	3,40	0,0000	—	3,40	0,33	0,72	2,23
23	1,0—2,15 *эв*	0,77	3,40	0,0000	—	3,40	0,33	0,72	2,23
24	0,465—1,0 *эв*	0,77	3,40	0,0001	—	3,40	0,33	0,72	2,23
25	0,215—0,465 *эв*	0,77	3,40	0,0002	—	3,40	0,33	0,72	2,23
T	0,0252 *эв*	—	3,40	0,0006	—	3,40	0,33	—	—

$\sigma_e(i, i+k)$ при k, равном						$\mu_e(i, i+k)$ при k, равном					
i	0	1	2	3	4	i	0	1	2	3	4
1	0,37	0,45	0,10	0,11	0,14	1	0,89	0,67	0,22	−0,24	−0,65
2	0,59	0,55	0,17	0,19	0,16	2	0,87	0,59	0,14	−0,30	−0,70
3	0,65	0,65	0,33	0,44	0,08	3	0,86	0,55	0,03	−0,35	−0,75
4	0,75	0,72	0,62	0,48	0,03	4	0,85	0,51	−0,06	−0,40	−0,80
5	0,67	1,05	0,77	0,40	0,01	5	0,85	0,46	−0,14	−0,40	−0,90
6	0,77	1,22	0,78	0,33	0,00	6	0,82	0,42	−0,20	−0,65	—
7	0,84	1,29	0,80	0,27	—	7	0,81	0,42	−0,24	−0,70	—
8	0,86	1,43	0,81	0,20	—	8	0,80	0,40	−0,27	−0,75	—
9	1,12	1,43	0,69	0,16	—	9	0,78	0,38	−0,29	−0,80	—
10	1,16	1,43	0,67	0,14	—	10	0,78	0,38	−0,29	−0,85	—
11	1,16	1,43	0,67	0,14	—	11	0,78	0,38	−0,29	−0,85	—
12	1,16	1,43	0,67	0,14	—	12	0,78	0,38	−0,29	−0,85	—
13	1,16	1,43	0,67	0,14	—	13	0,78	0,38	−0,29	−0,85	—
14	1,16	1,43	0,67	0,14	—	14	0,78	0,38	−0,29	−0,85	—
15	1,16	1,43	0,67	0,14	—	15	0,78	0,38	−0,29	−0,85	—
16	1,16	1,43	0,67	0,14	—	16	0,78	0,38	−0,29	−0,85	—
17	1,16	1,43	0,67	0,14	—	17	0,78	0,38	−0,29	−0,85	—
18	1,16	1,43	0,67	0,14	—	18	0,78	0,38	−0,29	−0,85	—
19	1,16	1,43	0,67	0,14	—	19	0,78	0,38	−0,29	−0,85	—
20	1,16	1,43	0,67	0,14	—	20	0,78	0,38	−0,29	−0,85	—
21	1,16	1,43	0,67	0,14	—	21	0,78	0,38	−0,29	−0,85	—
22	1,16	1,43	0,67	0,14	—	22	0,78	0,38	−0,29	−0,85	—
23	1,16	1,43	0,67	0,14	—	23	0,78	0,38	−0,29	−0,85	—
24	1,16	1,43	0,80	—	—	24	0,78	0,38	−0,39	—	—
25	1,16	2,24	—	—	—	25	0,78	0,10	—	—	—

i	$\sigma_{in}(i, i+k)$ при k, равном						
	0	1	2	3	4	5	6
1	0,00	0,02	0,06	0,06	0,04	0,03	0,01
2	0,00	0,00	0,02	0,03	0,02	0,01	—

i	$\mu_{in}(i, i+k)$ при k, равном						
	0	1	2	3	4	5	6
1	—	0,85	0,75	0,65	0,55	0,40	0,40
2	—	—	0,80	0,70	0,60	0,50	—

Lithium (Li^6)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{\text{э}}(e)$	$\mu_{\text{э}}(e)$
1	6,5—10,5 *Мэв*	0,46	1,80	0,06	0,35	1,39	0,50	0,167	0,745	+0,10
2	4,0—6,5 *Мэв*	0,48	2,00	0,10	0,25	1,65	0,40	0,200	0,875	—0,10
3	2,5—4,0 *Мэв*	0,48	1,90	0,16	0,08	1,66	0,30	0,234	0,881	—0,25
4	1,4—2,5 *Мэв*	0,57	1,40	0,25	—	1,15	0,18	0,274	0,553	—0,30
5	0,8—1,4 *Мэв*	0,57	1,50	0,30	—	1,20	0,15	0,284	0,598	—0,35
6	0,4—0,8 *Мэв*	0,69	2,10	0,50	—	1,60	0,25	0,250	0,580	—0,20
7	0,2—0,4 *Мэв*	0,69	6,70	2,00	—	4,70	0,20	0,267	1,82	—0,20
8	0,1—0,2 *Мэв*	0,69	2,50	0,95	—	1,55	0,05	0,317	0,712	—0,30
9	46,5—100 *кэв*	0,77	1,60	0,70	—	0,90	0,07	0,310	0,362	—0,30
10	21,5—46,5 *кэв*	0,77	1,75	0,85	—	0,90	0,09	0,304	0,355	—0,30
11	10,0—21,5 *кэв*	0,77	2,10	1,20	—	0,90	0,11	0,297	0,347	—0,25
12	4,65—10,0 *кэв*	0,77	2,70	1,80	—	0,90	0,11	0,297	0,347	—0,25
13	2,15—4,65 *кэв*	0,77	3,50	2,60	—	0,90	0,11	0,297	0,347	—0,25
14	1,0—2,15 *кэв*	0,77	4,80	3,90	—	0,90	0,11	0,297	0,347	—0,25
15	465—1000 *эв*	0,77	6,60	5,70	—	0,90	0,11	0,297	0,347	—0,25
16	215—465 *эв*	0,77	9,30	8,40	—	0,90	0,11	0,297	0,347	—0,25
17	100—215 *эв*	0,77	12,9	12,0	—	0,90	0,11	0,297	0,347	—0,25
18	46,5—100 *эв*	0,77	18,9	18,0	—	0,90	0,11	0,297	0,347	—0,25
19	21,5—46,5 *эв*	0,77	26,9	26,0	—	0,90	0,11	0,297	0,347	—0,25
20	10,0—21,5 *эв*	0,77	39,9	39,0	—	0,90	0,11	0,297	0,347	—0,25
21	4,65—10,0 *эв*	0,77	57,9	57,0	—	0,90	0,11	0,297	0,347	—0,25
22	2,15—4,65 *эв*	0,77	84,9	84,0	—	0,90	0,11	0,297	0,347	—0,25
23	1,0—2,15 *эв*	0,77	123,9	123,0	—	0,90	0,11	0,297	0,347	—0,25
24	0,465—1,0 *эв*	0,77	181,9	181,0	—	0,90	0,11	0,297	0,347	—0,25
25	0,215—0,465 *эв*	0,77	264,9	264,0	—	0,90	0,11	0,297	0,347	—0,25
T	0,0252 *эв*	—	945,9	945,0	—	0,90	0,11	—	—	—

i	$\sigma_{in}(i, i+k)$ при k, равном					
	0	1	2	3	4	5
1	0,00	0,05	0,05	0,02	0,12	0,11
2	0,00	0,02	0,06	0,08	0,08	0,01
3	0,00	0,00	0,02	0,04	0,02	—

i	$\mu_{in}(i, i+k)$ при k, равном					
	0	1	2	3	4	5
1	—	0,40	—0,10	0,40	0,30	0,00
2	—	0,40	0,20	0,20	0,10	0,10
3	—	—	0,40	0,25	0,00	—

Lithium (Li^7)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_3(e)$	$\mu_3(e)$
1	6,5—10,5 *Мэв*	0,48	1,90	0,001	0,40	1,50	0,50	0,146	0,746	+0,10
2	4,0—6,5 *Мэв*	0,48	2,40	0,000	0,30	2,10	0,40	0,175	1,00	—0,10
3	2,5—4,0 *Мэв*	0,48	2,20	0,000	0,25	1,95	0,30	0,204	0,910	—0,25
4	1,4—2,5 *Мэв*	0,57	1,70	0,000003	0,25	1,45	0,17	0,241	0,613	—0,30
5	0,8—1,4 *Мэв*	0,57	1,50	0,000005	0,16	1,34	0,06	0,273	0,642	—0,40
6	0,4—0,8 *Мэв*	0,69	1,20	0,000008	0,03	1,17	0,08	0,314	0,532	—0,50
7	0,2—0,4 *Мэв*	0,69	3,80	0,000025	—	3,80	0,08	0,268	1,474	—0,30
8	0,1—0,2 *Мэв*	0,69	1,20	0,000022	—	1,20	0,25	0,218	0,379	—0,15
9	46,5—100 *кэв*	0,77	1,05	0,000023	—	1,05	0,15	0,247	0,337	—0,20
10	21,5—46,5 *кэв*	0,77	1,05	0,000030	—	1,05	0,10	0,262	0,357	—0,26
11	10,0—21,5 *кэв*	0,77	1,05	0,000044	—	1,05	0,10	0,262	0,357	—0,26
12	4,65—10,0 *кэв*	0,77	1,08	0,000065	—	1,08	0,10	0,262	0,367	—0,26
13	2,15—4,65 *кэв*	0,77	1,09	0,000095	—	1,09	0,10	0,262	0,371	—0,26
14	1,0—2,15 *кэв*	0,77	1,10	0,00014	—	1,10	0,10	0,262	0,374	—0,26
15	465—1000 *эв*	0,77	1,10	0,00021	—	1,10	0,10	0,262	0,374	—0,26
16	215—465 *эв*	0,77	1,10	0,00030	—	1,10	0,10	0,262	0,374	—0,26
17	100—215 *эв*	0,77	1,10	0,00044	—	1,10	0,10	0,262	0,374	—0,26
18	46,5—100 *эв*	0,77	1,10	0,00065	—	1,10	0,10	0,262	0,374	—0,26
19	21,5—46,5 *эв*	0,77	1,10	0,00095	—	1,10	0,10	0,262	0,374	—0,26
20	10,0—21,5 *эв*	0,77	1,10	0,0014	—	1,10	0,10	0,262	0,374	—0,26
21	4,65—10,0 *эв*	0,77	1,10	0,0021	—	1,10	0,10	0,262	0,374	—0,26
22	2,15—4,65 *эв*	0,77	1,10	0,0030	—	1,10	0,10	0,262	0,374	—0,26
23	1,0—2,15 *эв*	0,77	1,10	0,0044	—	1,10	0,10	0,262	0,374	—0,26
24	0,465—1,0 *эв*	0,77	1,11	0,0065	—	1,10	0,10	0,262	0,374	—0,26
25	0,215—0,465 *эв*	0,77	1,11	0,0095	—	1,10	0,10	0,262	0,374	—0,26
T	0,0252 *эв*	—	1,13	0,034	—	1,10	0,10	—	—	—

i	$\sigma_{in}(i, i+k)$ при k, равном					
	0	1	2	3	4	5
1	0,02	0,11	0,05	0,10	0,09	0,03
2	0,04	0,16	0,03	0,01	0,04	0,02
3	0,03	0,20	0,02	—	—	—
4	0,03	0,17	0,05	—	—	—
5	0,00	0,09	0,07	—	—	—
6	0,00	0,00	0,03	—	—	—

i	$\mu_{in}(i, i+k)$ при k, равном					
	0	1	2	3	4	5
1	0,60	0,15	0,00	0,50	0,10	—0,20
2	0,50	0,10	—0,40	0,70	0,30	0,30
3	0,50	0,10	—0,30	—	—	—
4	0,40	0,15	—0,20	—	—	—
5	—	0,20	0,00	—	—	—
6	—	—	0,30	—	—	—

Beryllium (Be)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{з(e)}$	$\mu_{з(e)}$
1	6,5—10,5 *Мэв*	0,48	1,70	0,030	0,55	1,12	0,64	0,081	0,373	+0,05
2	4,0—6,5 *Мэв*	0,48	1,90	0,070	0,55	1,28	0,52	0,108	0,410	—0,10
3	2,5—4,0 *Мэв*	0,48	2,70	0,095	0,40	2,20	0,28	0,162	0,832	—0,35
4	1,4—2,5 *Мэв*	0,57	1,90	0,040	0,00	1,86	0,23	0,173	0,565	—0,25
5	0,8—1,4 *Мэв*	0,57	3,20	0,003	—	3,20	0,23	0,173	0,971	—0,20
6	0,4—0,8 *Мэв*	0,69	3,90	0,000	—	3,90	0,12	0,198	1,12	—0,25
7	0,2—0,4 *Мэв*	0,69	4,20	0,000	—	4,20	0,10	0,202	1,23	—0,27
8	0,1—0,2 *Мэв*	0,69	5,10	0,000	—	5,10	0,09	0,204	1,51	—0,27
9	46,5—100 *кэв*	0,77	5,60	0,000	—	5,60	0,08	0,207	1,51	—0,28
10	21,5—46,5 *кэв*	0,77	5,80	0,000	—	5,80	0,07	0,209	1,57	—0,28
11	10,0—21,5 *кэв*	0,77	5,90	0,000	—	5,90	0,07	0,209	1,60	—0,28
12	4,65—10.0 *кэв*	0,77	6,00	0,000	—	6,00	0,07	0,209	1,63	—0,28
13	2,15—4,65 *кэв*	0,77	6,00	0,000	—	6,00	0,07	0,209	1,63	—0,28
14	1,0—2,15 *кэв*	0,77	6,00	0,000	—	6,00	0,07	0,209	1,63	—0,28
15	465—1000 *эв*	0,77	6,00	0,000	—	6,00	0,07	0,209	1,63	—0,28
16	215—465 *эв*	0,77	6,00	0,000	—	6,00	0,07	0,209	1,63	—0,28
17	100—215 *эв*	0,77	6,00	0,000	—	6,00	0,07	0,209	1,63	—0,28
18	46,5—100 *эв*	0,77	6,00	0,000	—	6,00	0,07	0,209	1,63	—0,28
19	21,5—46,5 *эв*	0,77	6,00	0,000	—	6,00	0,07	0,209	1,63	—0,28
20	10,0—21,5 *эв*	0,77	6,00	0,000	—	6,00	0,07	0,209	1,63	—0,28
21	4,65—10,0 *эв*	0,77	6,00	0,000	—	6,00	0,07	0,209	1,63	—0,28
22	2,15—4,65 *эв*	0,77	6,00	0,000	—	6,00	0,07	0,209	1,63	—0,28
23	1,0—2,15 *эв*	0,77	6,00	0,001	—	6,00	0,07	0,209	1,63	—0,28
24	0,465—1,0 *эв*	0,77	6,00	0,001	—	6,00	0,07	0,209	1,63	—0,28
25	0,215—0,465 *эв*	0,77	6,00	0,002	—	6,00	0,07	0,209	1,63	—0,28
T	0,0252 *эв*	—	6,01	0,006	—	6,00	0,07	—	—	—

i	$\sigma_{in\,(i,\,i+k)}$ при k, равном					
	0	1	2	3	4	5
1	0,00	0,13	0,39	0,21	0,17	0,20
2	0,00	0,07	0,36	0,34	0,31	0,02
3	0,00	0,02	0,22	0,45	0,09	0,02

i	$\mu_{in\,(i,\,i+k)}$ при k, равном					
	0	1	2	3	4	5
1	—	0,50	0,30	0,00	0,20	—0,10
2	—	0,60	0,35	0,10	0,00	—0,30
3	—	0,70	0,50	0,10	0,10	0,00

i	f_t при σ_0, равной				f_e при σ_0, равной			
	∞	10	1	0	∞	10	1	0
3	1,00	0,99	0,97	0,95	1,00	1,00	0,98	0,97
4	1,00	1,00	0,99	0,98	1,00	1,00	1,00	0,99
5	1,00	1,00	0,99	0,97	1,00	1,00	0,99	0,98
6	1,00	1,00	0,98	0,97	1,00	1,00	0,99	0,98

Boron (B^{10})

i	E_n	Δu	σ_t	σ_c	σ_n	σ_e	μ_e	ξ	$\sigma_3(e)$	$\mu_3(e)$
1	6,5—10,5 *Мэв*	0,48	1,50	0,15	0,30	1,05	0,51	0,0980	0,403	+0,05
2	4,0—6,5 *Мэв*	0,48	1,60	0,30	0,13	1,17	0,44	0,112	0,388	—0,10
3	2,5—4,0 *Мэв*	0,48	1,90	0,25	0,06	1,59	0,36	0,128	0,483	—0,25
4	1,4—2,5 *Мэв*	0,57	2,10	0 30	0,03	1,77	0,28	0,144	0,447	—0,15
5	0,8—1,4 *Мэв*	0,57	2,50	0,22	0,00	2,28	0,20	0,160	0,640	—0,20
6	0,4—0,8 *Мэв*	0,69	4,10	0,50	—	3,60	0,08	0,184	0,960	—0,25
7	0,2—0,4 *Мэв*	0,69	4,90	0,90	—	4,00	0,07	0,186	1,078	—0,28
8	0,1—0,2 *Мэв*	0,69	4,80	1,60	—	3,2	0,07	0,186	0,863	—0,28
9	46,5—100 *кэв*	0,77	4,80	2,40	—	2,4	0,07	0,186	0,580	—0,28
10	21,5—46,5 *кэв*	0,77	5,60	3,60	—	2,0	0,07	0,186	0,483	—0,28
11	10,0—21,5 *кэв*	0,77	7,50	5,20	—	2,3	0,07	0,186	0,556	—0,28
12	4,65—10,0 *кэв*	0,77	10,3	7,70	—	2,6	0,07	0,186	0,628	—0,28
13	2,15—4,65 *кэв*	0,77	14,1	11,2	—	2,9	0,07	0,186	0,701	—0,28
14	1,0—2,15 *кэв*	0,77	19,7	16,6	—	3,10	0,07	0,186	0,749	—0,28
15	465 —1000 *эв*	0,77	27,5	24,3	—	3,20	0,07	0,186	0,773	—0,28
16	215—465 *эв*	0,77	39,0	35,7	—	3,30	0,07	0,186	0,797	—0,28
17	100—215 *эв*	0,77	55,8	52,5	—	3,30	0,07	0,186	0,797	—0,28
18	46,5—100 *эв*	0,77	80,3	77,0	—	3,30	0,07	0,186	0,797	—0,28
19	21,5—46,5 *эв*	0,77	115	112	—	3,30	0,07	0,186	0,797	—0,28
20	10,0—21,5 *эв*	0,77	169	166	—	3,30	0,07	0,186	0,797	—0,28
21	4,65—10,0 *эв*	0,77	246	243	—	3,30	0,07	0,186	0,797	—0,28
22	2,15—4,65 *эв*	0,77	360	357	—	3,30	0,07	0,186	0,797	—0,28
23	1,0—2,15 *эв*	0,77	528	525	—	3,30	0,07	0,186	0,797	—0,28
24	0,465—1,0 *эв*	0,77	773	770	—	3,30	0,07	0,186	0,797	—0,28
25	0,215—0,465 *эв*	0,77	1123	1120	—	3,30	0,07	0,186	—	—0,28
T	0,0252 *эв*	—	4020	4017	—	3,30	—	—	—	—

i	$\sigma_{in}(i,\ i+k)$ при k, равном					
	0	1	2	3	4	5
1	0,00	0,03	0,07	0,11	0,06	0,03
2	0,01	0,03	0,04	0,04	0,01	—
3	0,00	0,04	0,01	0,01	—	—
4	0,00	0,03	—	—	—	—

i	$\mu_{in}(i,\ i+k)$ при k, равном					
	0	1	2	3	4	5
1	—	0,20	0,20	0,00	0,30	0,00
2	—	0,10	0,10	0,20	0,10	—
3	—	0,10	0,30	0,00	—	—
4	—	0,10	—	—	—	—

f_c, f_t and $f_e \approx 1$ at any σ_0.

Boron (B^{11})

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{3(e)}$	$\mu_{3(e)}$
1	6,5—10,5 *Мэв*	0,48	1,50	0,01	0,40	1,09	0,51	0 0675	0,384	0,00
2	4,0—6,5 *Мэв*	0,48	1,55	0,00	0,15	1,40	0,44	0,100	0,420	—0,15
3	2,5—4,0 *Мэв*	0,48	1,65	0,00	0,03	1,62	0,31	0,123	0,473	—0,30
4	1,4—2,5 *Мэв*	0,57	2,00	0,00	0,00	2,00	0,12	0,157	0,551	—0,30
5	0,8—1,4 *Мэв*	0,57	2,20	0,00	—	2,20	0,12	0,157	0,606	—0,25
6	0,4—0,8 *Мэв*	0,69	2,80	0,00	—	2,80	0,20	0,143	0,580	—0,20
7	0,2—0,4 *Мэв*	0,69	3,50	0,00	—	3,50	0,08	0,164	0,832	—0,29
8	0,1—0,2 *Мэв*	0,69	3,70	0,00	—	3,70	0,08	0,164	0,879	—0,29
9	46,5—100 *кэв*	0,77	3,80	0,00	—	3,80	0,07	0,166	0,819	—0,29
10	21,5—46,5 *кэв*	0,77	3,80	0,00	—	3,80	0,06	0,168	0,829	—0,29
11	10,0—21,5 *кэв*	0,77	3,80	0,00	—	3,80	0,06	0,168	0,829	—0,29
12	4,65—10,0 *кэв*	0,77	3,80	0,00	—	3,80	0,06	0,168	0,829	—0,29
13	2,15—4,65 *кэв*	0,77	3,80	0,00	—	3,80	0,06	0,168	0,829	—0,29
14	1,0—2,15 *кэв*	0,77	3,80	0,00	—	3,80	0,06	0,168	0,829	—0,29
15	465—1000 *эв*	0,77	3,80	0,00	—	3,80	0,06	0,168	0,829	—0,29
16	215—465 *эв*	0,77	3,80	0,00	—	3,80	0,06	0,168	0,829	—0,29
17	100—215 *эв*	0,77	3,80	0,00	—	3,80	0,06	0,168	0,829	—0,29
18	46,5—100 *эв*	0,77	3,80	0,00	—	3,80	0,06	0,168	0,829	—0,29
19	21,5—46,5 *эв*	0,77	3,80	0,00	—	3,80	0,06	0,168	0,829	—0,29
20	10,0—21,5 *эв*	0,77	3,80	0,00	—	3,80	0,06	0,168	0,829	—0,29
21	4,65—10,0 *эв*	0,77	3,80	0,00	—	3,80	0,06	0,168	0,829	—0,29
22	2,15—4,65 *эв*	0,77	3,80	0,00	—	3,80	0,06	0,168	0,829	—0,29
23	1,0—2,15 *эв*	0,77	3,80	0,00	—	3,80	0,06	0,168	0,829	—0,29
24	0,465—1,0 *эв*	0,77	3,80	0,00	—	3,80	0,06	0,168	0,829	—0,29
25	0,215—0,465 *эв*	0,77	3,80	0,00	—	3,80	0,06	0,168	0,829	—0,29
T	0,0252 *эв*	—	3,80	0,00	—	3,80	0,06	—	—	—

i	$\sigma_{in}(i, i+k)$ при k, равном						
	0	1	2	3	4	5	6
1	0,00	0,01	0,07	0,12	0,10	0,07	0,03
2	0,00	0,02	0,04	0,03	0,04	0,02	—
3	0,00	0,00	0,01	0,01	0,01	—	—

i	$\mu_{in}(i, i+k)$ при к, равном						
	0	1	2	3	4	5	6
1	—	0,40	0,30	0,10	0,10	0,00	—0,20
2	—	0,20	0,00	0,20	0,00	0,10	—
3	—	—	0,20	0,00	0,20	—	—

Carbon (C)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{3(e)}$	$\mu_{3(e)}$
1	3,5—10,5 *Мэв*	0,48	1,20	0,002	0,35	0,85	0,35	0,109	0,351	+0,00
2	4,0—6,5 *Мэв*	0,48	1,45	0,000	0,08	1,37	0,18	0,138	0,544	—0,25
3	2,5—4,0 *Мэв*	0,48	2,00	0,000	—	2,00	0,08	0,155	0,726	—0,40
4	1,4—2,5 *Мэв*	0,57	1,80	0,000	—	1,80	0,11	0,150	0,474	—0,30
5	0,8—1,4 *Мэв*	0,57	2,55	0,000	—	2,55	0,13	0,146	0,653	—0,25
6	0,4—0,8 *Мэв*	0,69	3,10	0,000	—	3,10	0,12	0,148	0,665	—0,25
7	0,2—0,4 *Мэв*	0,69	4,00	0,000	—	4,00	0,08	0,155	0,899	—0,30
8	0,1—0,2 *Мэв*	0,69	4,30	0,000	—	4,30	0,07	0,156	0,972	—0,30
9	46,5—100 *кэв*	0,77	4,50	0,000	—	4,50	0,06	0,158	0,923	—0,29
10	21,5—46,5 *кэв*	0,77	4,60	0,000	—	4,60	0,06	0,158	0,944	—0,29
11	10,0—21,5 *кэв*	0,77	4,70	0,000	—	4,70	0,06	0,158	0,964	—0,29
12	4,65—10,0 *кэв*	0,77	4,70	0,000	—	4,70	0,06	0,158	0,964	—0,29
13	2,15—4,65 *кэв*	0,77	4,70	0,000	—	4,70	0,06	0,158	0,964	—0,29
14	1,0—2,15 *кэв*	0,77	4,70	0,000	—	4,70	0,06	0,158	0,964	—0,29
15	465—1000 *эв*	0,77	4,70	0,000	—	4,70	0,06	0,158	0,964	—0,29
16	215—465 *эв*	0,77	4,70	0,000	—	4,70	0,06	0,158	0,964	—0,29
17	100—215 *эв*	0,77	4,70	0,000	—	4,70	0,06	0,158	0,964	—0,29
18	46,5—100 *эв*	0,77	4,70	0,000	—	4,70	0,06	0,158	0,964	—0,29
19	21,5—46,5 *эв*	0,77	4,70	0,000	—	4,70	0,06	0,158	0,964	—0,29
20	10,0—21,5 *эв*	0,77	4,70	0,000	—	4,70	0,06	0,158	0,964	—0,29
21	4,65—10,0 *эв*	0,77	4,70	0,000	—	4,70	0,06	0,158	0,964	—0,29
22	2,15—4,65 *эв*	0,77	4,70	0,000	—	4,70	0,06	0,158	0,964	—0,29
23	1,0—2,15 *эв*	0,77	4,70	0,000	—	4,70	0,06	0,158	0,964	—0,29
24	0,465—1,0 *эв*	0,77	4,701	0,001	—	4,70	0,06	0,158	0,964	—0,29
25	0,215—0,465 *эв*	0,77	4,701	0,001	—	4,70	0,06	0,158	0,964	—0,29
T	0,0252 *эв*	—	4,704	0,004	—	4,70	0,06	—	—	—

i	$\sigma_{in}(i, i+k)$ при k, равном						
	0	1	2	3	4	5	6
1	0,00	0,00	0,07	0,20	0,05	0,02	0,01
2	0,00	0,00	0,00	0,05	0,02	0,01	—

i	$\mu_{in}(i, i+k)$ при k, равном						
	0	1	2	3	4	5	6
1	—	—	0,40	0,10	0,00	0,20	0,00
2	—	—	—	0,30	0,10	0,10	—

i	f_t при σ_0, равной				f_e при σ_0, равной			
	∞	10	1	0	∞	10	1	0
1	1,00	0,99	0,88	0,81	1,00	0,99	0,94	0,89
2	1,00	0,99	0,90	0,85	1,00	0,99	0,95	0,91
3	1,00	1,00	0,96	0,94	1,00	1,00	0,98	0,96

Nitrogen **(N)**

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_э(e)$	$\mu_э(e)$
1	6,5—10,5 *Мэв*	0,48	1,40	0,250	0,35	0,80	0,35	0,093	0,295	0,00
2	4,0—6,5 *Мэв*	0,48	1,60	0,220	0,15	1,23	0,25	0,107	0,392	—0,25
3	2,5—4,0 *Мэв*	0,48	1,65	0,200	0,00	1,45	0,21	0,113	0,389	—0,35
4	1,4—2,5 *Мэв*	0,57	1,95	0,085	—	1,86	0,13	0,124	0,405	—0,30
5	0,8—1,4 *Мэв*	0,57	1,82	0,030	—	1,79	0,06	0,135	0,424	—0,30
6	0,4—0,8 *Мэв*	0,69	2,30	0,045	—	2,25	0,05	0,136	0,443	—0,30
7	0,2—0,4 *Мэв*	0,69	3,20	0,0016	—	3,20	0,05	0,136	0,631	—0,30
8	0,1—0,2 *Мэв*	0,69	4,10	0,0015	—	4,10	0,05	0,136	0,808	—0,30
9	46,5—100 *кэв*	0,77	5,00	0,0015	—	5,00	0,05	0,136	0,883	—0,30
10	21,5—46,5 *кэв*	0,77	6,10	0,0017	—	6,10	0,05	0,136	1,08	—0,30
11	10,0—21,5 *кэв*	0,77	7,20	0,0024	—	7,20	0,05	0,136	1,27	—0,30
12	4,65—10,0 *кэв*	0,77	8,30	0,0035	—	8,30	0,05	0,136	1,47	—0,30
13	2,15—4,65 *кэв*	0,77	8,80	0,0052	—	8,79	0,05	0,136	1,55	—0,30
14	1,0—2,15 *кэв*	0,77	9,10	0,0078	—	9,09	0,05	0,136	1,61	—0,30
15	465—1000 *эв*	0,77	9,40	0,011	—	9,39	0,05	0,136	1,66	—0,30
16	215—465 *эв*	0,77	9,50	0,017	—	9,48	0,05	0,136	1,68	—0,30
17	100—215 *эв*	0,77	9,62	0,024	—	9,60	0,05	0,136	1,70	—0,30
18	46,5—100 *эв*	0,77	9,74	0,035	—	9,70	0,05	0,136	1,71	—0,30
19	21,5—46,5 *эв*	0,77	9,85	0 052	—	9,80	0,05	0,136	1,73	—0,30
20	10,0—21,5 *эв*	0,77	9,88	0,077	—	9,80	0,05	0,136	1,73	—0,30
21	4,65—10,0 *эв*	0,77	9,91	0,112	—	9,80	0,05	0,136	1,73	—0,30
22	2,15—4,65 *эв*	0,77	9,97	0,165	—	9,80	0,05	0,136	1,73	—0,30
23	1,0—2,15 *эв*	0,77	10,0	0,242	—	9,80	0,05	0,136	1,73	—0,30
24	0,465—1,0 *эв*	0,77	10,2	0,354	—	9,80	0,05	0,136	1,73	—0,30
25	0,215—0,465 *эв*	0,77	10,3	0,520	—	9,80	0,05	0,136	1,73	—0,30
T	0,0252 *эв*	—	11,6	1,850	—	9,80	0,05	—	—	—

i	$\sigma_{in}(i, i+k)$ при k, равном						
	0	1	2	3	4	5	6
1	0,00	0,02	0,08	0,11	0,07	0,05	0,02
2	0,00	0,00	0,01	0,05	0,06	0,03	—

i	$\mu_{in}(i, i+k)$ при k, равном						
	0	1	2	3	4	5	6
	—	0,50	0,20	0,00	0,10	0,20	0,00
2	--	—	0,40	0,10	0,20	0,10	—

i	f_t при σ_0, равной				f_e при σ_0, равной			
	∞	10	1	0	∞	10	1	0
2	1,00	1,00	0,98	0,97	1,00	1,00	1,00	0,99
3	1,00	1,00	1,00	0,99	1,00	1,00	1,00	1,00
4	1,00	1,00	0,97	0,95	1,00	1,00	0,99	0,97
5	1,00	0,98	0,91	0,87	1,00	0,99	0,95	0,93
6	1,00	0,98	0,94	0,92	1,00	0,99	0,97	0,96

Oxygen (0)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{3(e)}$	$\mu_{3(e)}$
1	6,5—10,5 *Мэв*	0,48	1,15	0,230	0,16	0,76	0,35	0,081	0,252	—0,05
2	4,0—6,5 *Мэв*	0,48	1,45	0,075	0,00	1,38	0,26	0,092	0,385	—0,30
3	2,5—4,0 *Мэв*	0,48	1,90	0,003	—	1,90	0,26	0,092	0,419	—0,30
4	1,4—2,5 *Мэв*	0,57	1,75	0,000	—	1,75	0,15	0,106	0,325	—0,40
5	0,8—1,4 *Мэв*	0,57	4,30	0,000	—	4,30	0,08	0,115	0,868	—0,50
6	0,4—0,8 *Мэв*	0,69	5,60	0,000	—	5,60	0,23	0,096	0,779	—0,20
7	0,2—0,4 *Мэв*	0,69	3,80	0,000	—	3,80	0,03	0,125	0,688	—0,40
8	0,1—0,2 *Мэв*	0,69	3,50	0,000	—	3,50	0,04	0,120	0,609	—0,31
9	46,5—100 *кэв*	0,77	3,55	0,000	—	3,55	0,04	0,120	0,553	—0,31
10	21,5—46,5 *кэв*	0,77	3,60	0,000	—	3,60	0,04	0,120	0,561	—0,31
11	10,0—21,5 *кэв*	0,77	3,65	0,000	—	3,65	0,04	0,120	0,569	—0,31
12	4,65—10,0 *кэв*	0,77	3,70	0,000	—	3,70	0,04	0,120	0,577	—0,31
13	2,15—4,65 *кэв*	0,77	3,75	0,000	—	3,75	0,04	0,120	0,584	—0,31
14	1,0—2,15 *кэв*	0,77	3,75	0,000	—	3,75	0,04	0,120	0,584	—0,31
15	465—1000 *эв*	0,77	3,75	0,000	—	3,75	0,04	0,120	0,584	—0,31
16	215—465 *эв*	0,77	3,75	0,000	—	3,75	0,04	0,120	0,584	—0,31
17	100—215 *эв*	0,77	3,75	0,000	—	3,75	0,04	0,120	0,854	—0,31
18	46,5—100 *эв*	0,77	3,75	0,000	—	3,75	0,04	0,120	0,584	—0,31
19	21,5—46,5 *эв*	0,77	3,75	0,000	—	3,75	0,04	0,120	0,584	—0,31
20	10,0—21,5 *эв*	0,77	3,75	0,000	—	3,75	0,04	0,120	0,584	—0,31
21	4,65—10,0 *эв*	0,77	3,75	0,000	—	3,75	0,04	0,120	0,584	—0,31
22	2,15—4,65 *эв*	0,77	3,75	0,000	—	3,75	0,04	0,120	0,584	—0,31
23	1,0—2,15 *эв*	0,77	3,75	0,000	—	3,75	0,04	0,120	0,584	—0,31
24	0,465—1,0 *эв*	0,77	3,75	0,000	—	3,75	0,04	0,120	0,584	—0,31
25	0,215—0,465 *эв*	0,77	3,75	0,000	—	3,75	0,04	0,120	0,584	—0,31
T	0,0252 *эв*	—	3,75	0,000	—	3,75	0,04	—	—	—

i	$\sigma_{in}(i, i+k)$ при k, равном						
	0	1	2	3	4	5	6
1	0,00	0,00	0,02	0,05	0,05	0,03	0,01

i	$\mu_{in}(i, i+k)$ при k, равном						
	0	1	2	3	4	5	6
1	—	—	0,20	0,20	0,20	0,20	0,20

i	f_c при σ_0, равной				f_t при σ_0, равной				f_e при σ_0, равной			
	∞	10	1	0	∞	10	1	0	∞	10	1	0
1	1,00	0,99	0,90	0,85	1,00	0,97	0,90	0,84	1,00	0,98	0,95	0,90
2	1,00	0,98	0,88	0,80	1,00	0,96	0,88	0,78	1,00	0,98	0,93	0,89
3	—	—	—	—	1,00	0,94	0,82	0,70	1,00	0,97	0,88	0,82
4	—	—	—	—	1,00	0,93	0,74	0,30	1,00	0,98	0,89	0,72
5	—	—	—	—	1,00	0,94	0,89	0,86	1,00	0,98	0,94	0,92
6	—	—	—	—	1,00	0,83	0,75	0,70	1,00	0,89	0,81	0,78
7	—	—	—	—	1,00	1,0	1,00	1,0	1,0	1,0	1,0	1,0

Sodium (Na)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_3(r)$
1	6,5—10 5 *Мэв*	0,48	2,20	0,050	0,65	1,50	0,60	0,0348	0,244
2	4,0—6,5 *Мэв*	0,48	2,30	0,005	0,65	1,64	0,50	0,0436	0,230
3	2,5—4,0 *Мэв*	0,48	2,60	0,0002	0,65	1,95	0,40	0,0523	0,248
4	1,4—2,5 *Мэв*	0,57	3,00	0,0002	0,58	2,42	0,34	0,0575	0,244
5	0,8—1,4 *Мэв*	0,57	3,80	0,0002	0,48	3,32	0,31	0,0600	0,350
6	0,4—0,8 *Мэв*	0,69	4,50	0,0003	0,13	4,37	0,08	0,0800	0,510
7	0,2—0,4 *Мэв*	0,69	4,00	0,0006	0,00	4,00	0,06	0,0820	0,475
8	0,1—0,2 *Мэв*	0,69	3,80	0,0012	—	3,80	0,04	0,0836	0,460
9	46,5—100 *кэв*	0,77	5,30	0,0016	—	5,30	0,03	0,0845	0,582
10	21,5—46,5 *кэв*	0,77	4,30	0,0026	—	4,30	0,03	0,0845	0,472
11	10,0—21,5 *кэв*	0,77	5,00	0,001	—	5,00	0,03	0,0845	0,549
12	4,65—10,0 *кэв*	0,77	8,00	0,001	—	8,00	0,03	0,0845	0,878
13	2,15—4,65 *кэв*	0,77	100,1	0,100	—	100,0	0,03	0,0845	10,97
14	1,0—2,15 *кэв*	0,77	6,21	0,010	—	6,20	0,03	0,0845	0,680
15	465—1000 *эв*	0,77	3,30	0,005	—	3,30	0,03	0,0845	0,362
16	215—465 *эв*	0,77	3,11	0,006	—	3,10	0,03	0,0845	0,340
17	100—215 *эв*	0,77	3,11	0,007	—	3,10	0,03	0,0845	0,340
18	46,5—100 *эв*	0,77	3,11	0,010	—	3,10	0,03	0,0845	0,340
19	21,5—46,5 *эв*	0,77	3,12	0,015	—	3,10	0,03	0,0845	0,340
20	10,0—21,5 *эв*	0,77	3,12	0,022	—	3,10	0,03	0,0845	0,340
21	4,65—10 *эв*	0,77	3,13	0,032	—	3,10	0,03	0,0845	0,340
22	2,15—4,65 *эв*	0,77	3,15	0,046	—	3,10	0,03	0,0845	0,340
23	1,0—2,15 *эв*	0,77	3,17	0,068	—	3,10	0,03	0,0845	0,340
24	0,465—1,0 *эв*	0,77	3,20	0,101	—	3,10	0,03	0,0845	0,340
25	0,215—0,465 *эв*	0,77	3,25	0,147	—	3,10	0,03	0,0845	0,340
T	0,0252 *эв*	—	3,63	0,525	—	3,10	0,03	—	—

i	$\sigma_{in}(i,\ i+k)$ при k, равном							
	0	1	2	3	4	5	6	7
1	0,01	0,05	0,12	0,20	0,15	0,08	0,03	0,01
2	0,09	0,13	0,17	0,13	0,09	0,03	0,01	—
3	0,22	0,20	0,09	0,09	0,04	0,01	—	—
4	0,30	0,27	0,00	0,01	—	—	—	—
5	0,11	0,34	0,03	—	—	—	—	—
6	0,00	0,09	0,03	0,01	—	—	—	—

i	f_c при σ_0, равной					f_t при σ_0, равной				f_e при σ_0, равной			
	∞	10^3	10^2	10	0	∞	10^2	10	0	∞	10^2	10	0
6	1,00	1,00	1,0	1,0	1,0	1,00	0,99	0,92	0,77	1,00	0,99	0,94	0,87
7	1,00	1,00	0,98	0,88	0,75	1,00	0,99	0,92	0,81	1,00	0,99	0,95	0,90
8	1,00	1,00	0,98	0,85	0,70	1,00	0,99	0,93	0,86	1,00	0,99	0,94	0,90
9	1,00	0,99	0,94	0,79	0,64	1,00	0,94	0,76	0,67	1,00	0,96	0,82	0,72
10	1,00	0,98	0,84	0,52	0,36	1,00	1,0	1,0	1,0	1,00	1,0	1,0	1,0
11	1,00	1,0	1,0	1,0	1,0	1,00	1,0	1,0	1,0	1,00	1,0	1,0	1,0
12	1,00	1,0	1,0	1,0	1,0	1,00	0,99	0,92	0,80	1,00	0,99	0,95	0,90
13	1,00	0,87	0,56	0,31	0,26	1,00	0,51	0,38	0,33	1,00	0,67	0,46	0,40
14	1,00	1,0	1,0	1,0	1,0	1,00	0,98	0,91	0,79	1,00	0,98	0,94	0,88

Magnesium (Mg)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{з(e)}$
1	6,5—10,5 *Мэв*	0,48	1,70	0,060	0,84	0,80	0,62	0,0318	0,120
2	4,0—6,5 *Мэв*	0,48	2,10	0,003	0,85	1,25	0,53	0,0393	0,159
3	2,5—4,0 *Мэв*	0,48	2,10	0,0002	0,75	1,35	0,42	0,0485	0,160
4	1,4—2,5 *Мэв*	0,57	2,60	0,0002	0,40	2,20	0,30	0,0585	0,226
5	0,8—1,4 *Мэв*	0,57	3,20	0,0003	0,01	3,19	0,35	0,0544	0,304
6	0,4—0,8 *Мэв*	0,69	5,00	0,0004	—	5,00	0,34	0,0552	0,400
7	0,2—0,4 *Мэв*	0,69	8,00	0,0004	—	8,00	0,14	0,0719	0,834
8	0,1—0,2 *Мэв*	0,69	4,70	0,0003	—	4,70	0,04	0,0803	0,547
9	46,5—100 *кэв*	0,77	8,50	0,0040	—	8,50	0,03	0,0811	0,895
10	21,5—46,5 *кэв*	0,77	4,00	0,0005	—	4,00	0,03	0,0811	0,421
11	10,0—21,5 *кэв*	0,77	4,00	0,0005	—	4,00	0,03	0,0811	0,421
12	4,65—10,0 *кэв*	0,77	3,50	0,0001	—	3,50	0,03	0,0811	0,369
13	2,15—4,65 *кэв*	0,77	3,50	0,0002	—	3,50	0,03	0,0811	0,369
14	1,0—2,15 *кэв*	0,77	3,50	0,0003	—	3,50	0,03	0,0811	0,369
15	465—1000 *эв*	0,77	3,50	0,0004	—	3,50	0,03	0,0811	0,369
16	215—465 *эв*	0,77	3,50	0,0006	—	3,50	0,03	0,0811	0,369
17	100—215 *эв*	0,77	3,50	0,0009	—	3,50	0,03	0,0811	0,369
18	46,5—1000 *эв*	0,77	3,50	0,0013	—	3,50	0,03	0,0811	0,369
19	21,5—46,5 *эв*	0,77	3,50	0,0019	—	3,50	0,03	0,0811	0,369
20	10,0—21,5 *эв*	0,77	3,50	0,0028	—	3,50	0,03	0,0811	0,369
21	4,65—10 *эв*	0,77	3,50	0,0042	—	3,50	0,03	0,0811	0,369
22	2,15—4,65 *эв*	0,77	3,51	0,0061	—	3,50	0,03	0,0811	0,369
23	1,0—2,15 *эв*	0,77	3,51	0,009	—	3,50	0,03	0,0811	0,369
24	0,465—1,0 *эв*	0,77	3,51	0,013	—	3,50	0,03	0,0811	0,369
25	0,215—0,465 *эв*	0,77	3,52	0,019	—	3,50	0,03	0,0811	0,369
T	0,0252 *эв*	—	3,57	0,069	—	3,50	0,03	—	—

i	$\sigma_{in\,(i,\,i+k)}$ при k, равном							
	0	1	2	3	4	5	6	7
1	0,01	0,20	0,14	0,20	0,16	0,09	0,03	0,01
2	0,11	0,41	0,13	0,10	0,06	0,03	0,01	—
3	0,06	0,39	0,27	0,03	—	—	—	—
4	0,01	0,15	0,17	0,06	0,01	—	—	—
5	0,00	0,01	—	—	—	—	—	—

i	f_c при σ_0, равной					f_t при σ_0, равной				f_e при σ_0, равной			
	10^3	10^2	10	1	0	∞	10	1	0	∞	10	1	0
6	1,00	1,00	1,00	—	—	1,00	0,89	—	—	1,00	0,93	—	—
7	1,00	1,0	1,00	—	—	1,00	0,96	—	—	1,00	0,97	—	—
8	1,00	1,0	1,0	—	—	1,00	1,0	—	—	1,00	1,0	—	—
9	0,98	0,85	0,59	—	—	1,00	0,69	—	—	1,00	0,82	—	—
10	1,00	0,97	0,81	—	—	1,00	0,96	—	—	1,00	0,98	—	—
11	1,00	0,97	0,81	—	—	1,00	0,96	—	—	1,00	0,98	—	—

Aluminum (Al)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_a(e)$
1	6,5—10,5 *Мэв*	0,48	1,90	0,095	0,80	1,00	0,64	0,0266	0,127
2	4,0—6,5 *Мэв*	0,48	2,20	0,023	0,75	1,43	0,57	0,0317	0,148
3	2,5—4,0 *Мэв*	0,48	2,70	0,002	0,65	2,05	0,47	0,0391	0,196
4	1,4—2,5 *Мэв*	0,57	3,00	0,0004	0,50	2,50	0,36	0,0472	0,207
5	0,8—1,4 *Мэв*	0,57	3,20	0,0004	0,13	3,07	0,29	0,0524	0,282
6	0,4—0,8 *Мэв*	0,69	4,00	0,0007	—	4,00	0,20	0,0590	0,342
7	0,2—0,4 *Мэв*	0,69	3,90	0,001	—	3,90	0,11	0,0657	0,371
8	0,1—0,2 *Мэв*	0,69	5,20	0,003	—	5,20	0,06	0,0694	0,523
9	46,5—100 *кэв*	0,77	5,00	0,002	—	5,00	0,04	0,0708	0,460
10	21,5—46,5 *кэв*	0,77	7,40	0,006	—	7,39	0,03	0,0716	0,687
11	10,0—21,5 *кэв*	0,77	1,00	0,001	—	1,00	0,02	0,0723	0,094
12	4,65—10,0 *кэв*	0,77	2,60	0,060	—	2,54	0,02	0,0723	0,238
13	2,15—4,65 *кэв*	0,77	1,40	0,0007	—	1,40	0,02	0,0723	0,131
14	1,0—2,15 *кэв*	0,77	1,40	0,0010	—	1,40	0,02	0,0723	0,131
15	465—1000 *эв*	0,77	1,40	0,0015	—	1,40	0,02	0,0723	0,131
16	215—465 *эв*	0,77	1,40	0,0021	—	1,40	0,02	0,0723	0,131
17	100—215 *эв*	0,77	1,40	0,0031	—	1,40	0,02	0,0723	0,131
18	46,5—100 *эв*	0,77	1,40	0,0046	—	1,40	0,02	0,0723	0,131
19	21,5—46,5 *эв*	0,77	1,41	0,0067	—	1,40	0,02	0,0723	0,131
20	10,0—21,5 *эв*	0,77	1,41	0,010	—	1,40	0,02	0,0723	0,131
21	4,65—10 *эв*	0,77	1,42	0,015	—	1,40	0,02	0,0723	0,131
22	2,15—4,65 *эв*	0,77	1,42	0,021	—	1,40	0,02	0,0723	0,131
23	1,0—2,15 *эв*	0,77	1,43	0,031	—	1,40	0,02	0,0723	0,131
24	0,465—1,0 *эв*	0,77	1,45	0,046	—	1,40	0,02	0,0723	0,131
25	0,215—0,465 *эв*	0,77	1,47	0,067	—	1,40	0,02	0,0723	0,131
T	0,0252 *эв*	—	1,64	0,241	—	1,40	0,02	—	—

i	$\sigma_{in}(i, i+k)$ при k, равном								
	0	1	2	3	4	5	6	7	8
1	0,01	0,06	0,15	0,25	0,18	0,10	0,04	0,01	—
2	0,05	0,26	0,22	0,11	0,07	0,03	0,01	—	—
3	0,06	0,31	0,13	0,10	0,04	0,01	—	—	—
4	0,04	0,27	0,19	—	—	—	—	—	—
5	0,00	0,03	0,06	0,03	0,01	—	—	—	—

i	f_c при σ_0, равной					f_t при σ_0, равной				f_e при σ_0, равной			
	10^3	10^2	10	1	0	∞	10	1	0	∞	10	1	0
4	1,00	1,00	1,0	1,0	1,0	1,00	1,00	0,97	0,95	1,00	1,00	0,99	0,98
5	1,00	1,00	1,0	1,0	1,0	1,00	0,99	0,92	0,85	1,00	1,00	0,96	0,93
6	1,00	1,00	1,0	1,0	1,0	1,00	0,97	0,81	0,65	1,00	0,98	0,93	0,81
7	1,00	1,0	1,0	1,0	1,0	1,00	0,84	0,76	0,68	1,00	0,96	0,88	0,84
8	1,00	0,98	0,90	0,83	0,80	1,00	0,81	0,59	0,51	1,00	0,90	0,76	0,71
9	1,00	0,95	0,70	0,50	0,40	1,00	0,63	0,41	0,37	1,00	0,78	0,57	0,52
10	0,98	0,87	0,56	0,33	0,23	1,00	0,40	0,14	0,10	1,00	0,61	0,31	0,20
11	1,00	1,00	1,0	1,0	1,0	1,00	1,00	1,0	1,0	1,00	1,00	1,0	1,0
12	0,92	0,60	0,25	0,12	0,09	1,00	0,57	0,54	0,53	1,00	0,62	0,56	0,54

Silicon (Si)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{з}(r)$
1	6,5—10,5 Мэв	0,48	1,80	0,30	0,60	0,90	0,65	0,0249	0,108
2	4,0—6,5 Мэв	0,48	2,20	0,03	0,85	1,32	0,60	0,0285	0,123
3	2,5—4,0 Мэв	0,48	2,60	0,00	0,60	2,00	0,52	0,0342	0,167
4	1,4--2,5 Мэв	0,57	3,00	0,00	0,12	2,88	0,28	0,0513	0,259
5	0,8--1,4 Мэв	0,57	3,20	0,00	0,00	3,20	0,28	0,0513	0,288
6	0,4--0,8 Мэв	0,69	3,50	0,00	—	3,50	0,14	0,0612	0,310
7	0,2—0,4 Мэв	0,69	5,30	0,00	—	5,30	0,07	0,0662	0,508
8	0,1—0,2 Мэв	0,69	2,70	0,00	—	2,70	0,05	0,0677	0,265
9	46,5—100 кэв	0,77	2,01	0,01	—	2,00	0,03	0,0691	0,179
10	21,5—46,5 кэв	0,77	1,61	0,01	—	1,60	0,02	0,0698	0,145
11	10,0—21,5 кэв	0,77	1,80	0,00	—	1,80	0,02	0,0698	0,163
12	4,65—10,0 кэв	0,77	2,50	0,00	—	2,50	0,02	0,0698	0,227
13	2,15—4,65 кэв	0,77	2,50	0,00	—	2,50	0,02	0,0698	0,227
14	1,0—2,15 кэв	0,77	2,50	0,00	—	2,50	0,02	0,0698	0,227
15	465—1000 эв	0,77	2,30	0,00	—	2,30	0,02	0,0698	0,208
16	215—465 эв	0,77	2,20	0,00	—	2,20	0,02	0,0698	0,199
17	100—215 эв	0,77	2,20	0,00	—	2,20	0,02	0,0698	0,199
18	46,5—100 эв	0,77	2,20	0,00	—	2,20	0,02	0,0698	0,199
19	21,5—46,5 эв	0,77	2,20	0,00	—	2,20	0,02	0,0698	0,199
20	10,0—21,5 эв	0,77	2,21	0,01	—	2,20	0,02	0,0698	0,199
21	4,65—10 эв	0,77	2,21	0,01	—	2,20	0,02	0,0698	0,199
22	2,15—4,65 эв	0,77	2,22	0,02	—	2,20	0,02	0,0698	0,199
23	1,0—2,15 эв	0,77	2,22	0,02	—	2,20	0,02	0,0698	0,199
24	0,465—1,0 эв	0,77	2,23	0,03	—	2,20	0,02	0,0698	0,199
25	0,215—0,465 эв	0,77	2,25	0,05	—	2,20	0,02	0,0698	0,199
T	0,0252 эв	—	2,36	0,16	—	2,20	0,02	—	—

i	$\sigma_{in}(i,\ i+k)$ при k, равном							
	0	1	2	3	4	5	6	7
1	0,01	0,05	0,11	0,18	0,13	0,08	0,03	0,01
2	0,05	0,42	0,21	0,08	0,05	0,03	0,01	—
3	0,00	0,30	0,26	0,04	0,00	0,00	—	—
4	0,00	0,00	0,08	0,03	0,01	—	—	—

f_c, f_t and $f_e \approx 1$ at $\sigma_e > 20$ barn

Potassium (K)

	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{s}(c)$
1	6,5—10,5 *Мэв*	0,48	2,70	0,330	0,80	1,57	0,63	0,0190	0,146
2	4,0—6,5 *Мэв*	0,48	3,20	0,240	0,50	2,46	0,53	0,0242	0,196
3	2,5—4,0 *Мэв*	0,48	3,50	0,150	0,16	3,19	0,40	0,0308	0,241
4	1,4—2,5 *Мэв*	0,57	3,10	0,065	0,01	3,02	0,30	0,0360	0,191
5	0,8—1,4 *Мэв*	0,57	2,10	0,025	—	2,08	0,28	0,0370	0,135
6	0,4—0,8 *Мэв*	0,69	2,10	0,003	—	2,10	0,26	0,0380	0,116
7	0,2—0,4 *Мэв*	0,69	2,30	0,004	—	2,30	0,14	0,0442	0,147
8	0,1—0,2 *Мэв*	0,69	2,60	0,006	—	2,59	0,10	0,0463	0,174
9	46,5—100 *кэв*	0,77	3,00	0,009	—	2,99	0,06	0,0483	0,188
10	21,5—46,5 *кэв*	0,77	2,80	0,014	—	2,79	0,04	0,0494	0,179
11	10,0—21,5 *кэв*	0,77	2,00	0,005	—	2,00	0,03	0,0499	0,130
12	4,65—10,0 *кэв*	0,77	3,70	0,033	—	3,67	0,02	0,0504	0,240
13	2,15—4,65 *кэв*	0,77	4,40	0,200	—	4,20	0,02	0,0504	0,275
14	1,0—2,15 *кэв*	0,77	2,01	0,009	—	2,00	0,02	0,0504	0,131
15	465—1000 *эв*	0,77	2,01	0,013	—	2,00	0,02	0,0504	0,131
16	215—465 *эв*	0,77	2,02	0,018	—	2,00	0,02	0,0504	0,131
17	100—215 *эв*	0,77	2,03	0,027	—	2,00	0,02	0,0504	0,131
18	46,5—100 *эв*	0,77	2,04	0,040	—	2,00	0,02	0,0504	0,131
19	21,5—46,5 *эв*	0,77	2,06	0,058	—	2,00	0,02	0,0504	0,131
20	10,0—21,5 *эв*	0,77	2,08	0,085	—	2,00	0,02	0,0504	0,131
21	4,65—10,0 *эв*	0,77	2,13	0,130	—	2,00	0,02	0,0504	0,131
22	2,15—4,65 *эв*	0,77	2,18	0,180	—	2,00	0,02	0,0504	0,131
23	1,0—2,15 *эв*	0,77	2,27	0,270	—	2,00	0,02	0,0504	0,131
24	0,465—1,0 *эв*	0,77	2,40	0,400	—	2,00	0,02	0,0504	0,131
25	0,215—0,465 *эв*	0,77	2,58	0,580	—	2,00	0,02	0,0504	0,131
T	0,0252 *эв*	—	4,07	2,070	—	2,00	0,02	—	—

i	$\sigma_{in}(i, i+k)$ при k, равном							
	0	1	2	3	4	5	6	7
1	0,00	0,06	0,15	0,25	0,19	0,10	0,04	0,01
2	0,00	0,04	0,16	0,15	0,10	0,04	0,01	—
3	0,00	0,00	0,08	0,06	0,02	—	—	—
4	0,00	0,01	—	—	—	—	—	—

i	f_c при σ_0, равной					f_t при σ_0, равной				f_e при σ_0, равной			
	∞	10^4	10^3	10	0	∞	10^3	10	0	∞	10^3	10	0
8	1,00	1,00	0,98	0,88	—	1,00	0,99	0,93	—	1,00	1,00	0,95	—
9	1,00	0,99	0,94	0,72	—	1,00	0,97	0,84	—	1,00	0,98	0,86	—
10	1,00	0,99	0,90	0,60	—	1,00	0,97	0,75	—	1,00	0,98	0,83	—
11	1,00	1,00	1,00	1,00	—	1,00	1,00	1,00	—	1,00	1,00	1,00	—
12	1,00	0,95	0,71	0,38	—	1,00	0,77	0,61	—	1,00	0,84	0,67	—
13	1,00	0,86	0,48	0,19	—	1,00	0,62	0,50	—	1,00	0,72	0,55	—

Calcium (Ca)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{э(r)}$
1	6,5—10,5 *Мэв*	0,48	2,80	0,02	1,15	1,63	0,63	0,0186	0,148
2	4,0—6,5 *Мэв*	0,48	3,50	0,01	0,76	2,73	0,53	0,0236	0,212
3	2,5—4,0 *Мэв*	0,48	3,70	0,00	0,05	3,65	0,40	0,0301	0,269
4	1,4—2,5 *Мэв*	0,57	2,90	0,00	—	2,90	0,28	0,0362	0,184
5	0,8—1,4 *Мэв*	0,57	3,20	0,00	—	3,20	0,18	0,0412	0,231
6	0,4—0,8 *Мэв*	0,69	2,90	0,00	—	2,90	0,17	0,0417	0,175
7	0,2—0,4 *Мэв*	0,69	2,90	0,00	—	2,90	0,09	0,0457	0,192
8	0,1—0,2 *Мэв*	0,69	2,00	0,00	—	2,00	0,03	0,0487	0,141
9	46,5—100 *кэв*	0,77	1,50	0,00	—	1,50	0,02	0,0492	0,096
10	21,5—46,5 *кэв*	0,77	1,50	0,00	—	1,50	0,02	0,0492	0,096
11	10,0—21,5 *кэв*	0,77	1,50	0,00	—	1,50	0,02	0,0492	0,096
12	4,65—10,0 *кэв*	0,77	1,90	0,00	—	1,90	0,02	0,0492	0,121
13	2,15—4,65 *кэв*	0,77	2,50	0,00	—	2,50	0,02	0,0492	0,160
14	1,0—2,15 *кэв*	0,77	2,90	0,00	—	2,90	0,02	0,0492	0,185
15	465—1000 *эв*	0,77	3,00	0,00	—	3,00	0,02	0,0492	0,192
16	215—465 *эв*	0,77	3,00	0,00	—	3,00	0,02	0,0492	0,192
17	100—215 *эв*	0,77	3,00	0,00	—	3,00	0,02	0,0492	0,192
18	46,5—100 *эв*	0,77	3,01	0,01	—	3,00	0,02	0,0492	0,192
19	21,5—46,5 *эв*	0,77	3,01	0,01	—	3,00	0,02	0,0492	0,192
20	10,0—21,5 *эв*	0,77	3,02	0 02	—	3,00	0,02	0,0492	0,192
21	4,65—10 *эв*	0,77	3,03	0,03	—	3,00	0,02	0,0492	0,192
22	2,15—4,65 *эв*	0,77	3,04	0,04	—	3,00	0,02	0,0492	0,192
23	1,0—2,15 *эв*	0,77	3,06	0,06	—	3,00	0,02	0,0492	0,192
24	0,465—1,0 *эв*	0,77	3,08	0,08	—	3,00	0,02	0,0492	0,192
25	0,215—0,465 *эв*	0,77	3,12	0,12	—	3,00	0,02	0,0492	0,192
T	0,0252 *эв*	—	3,44	0,44	—	3,00	0,02	—	—

i	$\sigma_{in(i,\,i+k)}$ при k, равном							
	0	1	2	3	4	5	6	7
1	0,00	0,03	0,21	0,36	0,29	0,18	0,06	0,02
2	0,00	0,02	0,17	0,26	0,21	0,08	0,02	—
3	0,00	0,00	0,00	0,02	0,02	0,01	—	—

f_c f_t and $f_e \approx 1$ at $\sigma_e > 20$ barn

Titanium (Ti)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{s(e)}$
1	6,5—10,5 *Мэв*	0,48	3,00	0,065	1,20	1,74	0,74	0,0108	0,094
2	4,0—6,5 *Мэв*	0,48	3,40	0,010	1,15	2,24	0,66	0,0141	0,105
3	2,5—4,0 *Мэв*	0,48	3,70	0,003	1,00	2,70	0,55	0,0187	0,124
4	1,4—2,5 *Мэв*	0,57	3,50	0,002	0,55	2,95	0,40	0,0249	0,129
5	0,8—1,4 *Мэв*	0,57	3,10	0,003	0,15	2,95	0,21	0,0328	0,170
6	0,4—0,8 *Мэв*	0,69	2,70	0,004	0,02	2,68	0,15	0,0353	0,137
7	0,2—0,4 *Мэв*	0,69	2,70	0,005	—	2,70	0,07	0,0386	0,151
8	0,1—0,2 *Мэв*	0,69	3,10	0,007	—	3,10	0,03	0,0403	0,181
9	46,5—100 *кэв*	0,77	8,90	0,012	—	8,89	0,02	0,0407	0,470
10	21,5—46,5 *кэв*	0,77	26,0	0,018	—	26,0	0,01	0,0411	1,39
11	10,0—21,5 *кэв*	0,77	61,0	0,020	—	61,0	0,01	0,0411	3,26
12	4,65—10,0 *кэв*	0,77	16,0	0,050	—	16,0	0,01	0,0411	0,854
13	2,15—4,65 *кэв*	0,77	24,0	0,620	—	23,4	0,01	0,0411	1,25
14	1,0—2,15 *кэв*	0,77	4,63	0,030	—	4,60	0,01	0,0411	0,246
15	465—1000 *эв*	0,77	4,34	0,035	—	4,30	0,01	0,0411	0,230
16	215—465 *эв*	0,77	4,25	0,051	—	4,20	0,01	0,0411	0,224
17	100—215 *эв*	0,77	4,28	0,076	—	4,20	0,01	0,0411	0,224
18	46,5—100 *эв*	0,77	4,31	0,111	—	4,20	0,01	0,0411	0,224
19	21,5—46,5 *эв*	0,77	4,36	0,162	—	4,20	0,01	0,0411	0,224
20	10,0—21,5 *эв*	0,77	4,44	0,239	—	4,20	0,01	0,0411	0,224
21	4,65—10 *эв*	0,77	4,55	0,351	—	4,20	0,01	0,0411	0,224
22	2,15—4,65 *эв*	0,77	4,71	0,512	—	4,20	0,01	0,0411	0,224
23	1,0—2,15 *эв*	0,77	4,96	0,759	—	4,20	0,01	0,0411	0,224
24	0,465—1,0 *эв*	0,77	5,31	1,110	—	4,20	0,01	0,0411	0,224
25	0,215—0,465 *эв*	0,77	5,82	1,620	—	4,20	0,01	0,0411	0,224
T	0,0252 *эв*	—	10,0	5,800	—	4,20	0,01	—	—

i	$\sigma_{in\,(i,\,i+k)}$ при k, равном							
	0	1	2	3	4	5	6	7
1	0,01	0,07	0,21	0,36	0,29	0,18	0,06	0,02
2	0,05	0,26	0,28	0,27	0,18	0,07	0,03	0,01
3	0,20	0,65	0,11	0,03	0,01	—	—	—
4	0,03	0,34	0,16	0,02	—	—	—	—
5	0,00	0,01	0,08	0,04	0,02	—	—	—
6	0,01	0,01	—	—	—	—	—	—

i	f_c при σ_0, равной					f_t при σ_0, равной				f_e при σ_0, равной			
	∞	10^3	10^2	10	0	∞	10^2	10	0	∞	10^2	10	0
8	1,0	0,99	0,92	0,80	—	1,0	0,99	0,89	—	1,0	1,00	0,91	—
9	1,0	1,00	0,94	0,75	—	1,0	0,92	0,53	—	1,0	0,95	0,84	—
10	1,0	0,98	0,86	0,70	—	1,0	0,80	0,40	—	1,0	0,90	0,64	—
11	1,0	0,98	0,91	0,80	—	1,0	0,85	0,69	—	1,0	0,93	0,83	—
12	1,0	0,99	0,94	0,80	—	1,0	0,97	0,83	—	1,0	0,99	0,89	—
13	1,0	0,84	0,46	0,29	—	1,0	0,49	0,24	—	1,0	0,62	0,39	—

Vanadium (V)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{3(e)}$
1	6,5—10,5 *Мэв*	0,48	3,20	0,010	1,25	1,94	0,71	0,0113	0,110
2	4,0—6,5 *Мэв*	0,48	3,70	0,002	1,20	2,50	0,62	0,0148	0,123
3	2,5—4,0 *Мэв*	0,48	4,00	0,001	1,10	2,90	0,50	0,0195	0,137
4	1,4—2,5 *Мэв*	0,57	3,70	0,001	0,86	2,84	0,36	0,0250	0,125
5	0,8—1,4 *Мэв*	0,57	3,20	0,002	0,55	2,65	0,18	0,0321	0,149
6	0,4—0,8 *Мэв*	0,69	3,40	0,002	0,24	3,16	0,16	0,0328	0,150
7	0,2—0,4 *Мэв*	0,69	5,30	0,004	0,02	5,28	0,07	0,0364	0,278
8	0,1—0,2 *Мэв*	0,69	6,00	0,007	—	5,99	0,03	0,0379	0,329
9	46,5—100 *кэв*	0,77	7,00	0,013	—	6,99	0,02	0,0383	0,347
10	21,5—46,5 *кэв*	0,77	12,0	0,025	—	12,0	0,01	0,0387	0,603
11	10,0—21,5 *кэв*	0,77	49,0	0,060	—	48,9	0,01	0,0387	2,46
12	4,65—10,0 *кэв*	0,77	62,0	0,160	—	61,8	0,01	0,0387	3,11
13	2,15—4,65 *кэв*	0,77	62,0	0,260	—	61,7	0,01	0,0387	3,09
14	1,0—2,15 *кэв*	0,77	8,00	0,035	—	7,96	0,01	0,0387	4,00
15	465—1000 *эв*	0,77	6,30	0,030	—	6,27	0,01	0,0387	0,315
16	215—465 *эв*	0,77	6,00	0,044	—	5,96	0,01	0,0387	0,299
17	100—215 *эв*	0,77	6,46	0,340	—	6,12	0,01	0,0387	0,307
18	46,5—100 *эв*	0,77	5,50	0,096	—	5,40	0,01	0,0387	0,271
19	21,5—46,5 *эв*	0,77	5,30	0,140	—	5,16	0,01	0,0387	0,259
20	10,0—21,5 *эв*	0,77	5,11	0,206	—	4,90	0,01	0,0387	0,246
21	4,65—10 *эв*	0,77	5,20	0,303	—	4,90	0,01	0,0387	0,246
22	2,15—4,65 *эв*	0,77	5,34	0,442	—	4,90	0,01	0,0387	0,246
23	1,0—2,15 *эв*	0,77	5,55	0,652	—	4,90	0,01	0,0387	0,246
24	0,465—1,0 *эв*	0,77	5,86	0,958	—	4,90	0,01	0,0387	0,246
25	0,215—0,465 *эв*	0,77	6,30	1,400	—	4,90	0,01	0,0387	0,246
T	0,0252 *эв*	—	9,90	5,000	—	4,90	0,01	—	—

i	$\sigma_{in\,(i,\,i+k)}$ при k, равном							
	0	1	2	3	4	5	6	7
1	0,01	0,08	0,21	0,38	0,30	0,19	0,06	0,02
2	0,05	0,18	0,36	0,31	0,21	0,07	0,02	0,00
3	0,17	0,37	0,25	0,19	0,08	0,03	0,01	—
4	0,35	0,34	0,13	0,03	0,01	—	—	—
5	0,20	0,28	0,05	0,02	—	—	—	—
6	0,06	0,12	0,06	—	—	—	—	—
7	0,00	0,00	0,02	—	—	—	—	—

i	f_c при σ_0, равной					f_t при σ_0, равной				f_e при σ_0, равной			
	∞	10^4	10^3	10	0	∞	10^2	10	0	∞	10^2	10	0
9	1,00	0,99	0,92	0,67	—	1,00	0,96	0,83	—	1,00	0,98	0,90	—
10	1,00	0,98	0,84	0,55	—	1,00	0,97	0,87	—	1,00	0,98	0,96	—
11	1,00	0,97	0,87	0,70	—	1,00	0,81	0,54	—	1,00	0,90	0,74	—
12	1,00	0,93	0,85	0,65	—	1,00	0,75	0,43	—	1,00	0,87	0,67	—
13	1,00	0,90	0,61	0,35	—	1,00	0,37	0,26	—	1,00	0,63	0,39	—
14	1,00	1,00	1,00	1,00	—	1,00	1,00	1,00	—	1,00	1,00	1,00	—
15	1,00	1,00	1,00	1,00	—	1,00	1,00	1,00	—	1,00	1,00	1,00	—
16	1,00	1,00	1,00	1,00	—	1,00	1,00	1,00	—	1,00	1,00	1,00	—
17	1,00	1,00	0,96	0,79	—	1,00	0,98	0,97	—	1,00	0,99	0,98	—

Chromium (Cr)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{3(e)}$
1	6,5—10,5 *Мэв*	0,48	3,30	0,035	1,30	1,97	0,80	0,0078	0,077
2	4,0—6,5 *Мэв*	0,48	3,60	0,003	1,25	2,35	0,67	0,0128	0,098
3	2,5—4,0 *Мэв*	0,48	3,80	0,003	1,10	2,70	0,45	0,0214	0,142
4	1,4—2,5 *Мэв*	0,57	3,10	0,003	0,73	2,37	0,32	0,0264	0,110
5	0,8—1,4 *Мэв*	0,57	2,80	0,004	0,04	2,76	0,19	0,0315	0,152
6	0,4—0,8 *Мэв*	0,69	2,90	0,004	—	2,90	0,16	0,0327	0,136
7	0,2—0,4 *Мэв*	0,69	2,60	0,005	—	2,60	0,11	0,0346	0,129
8	0,1—0,2 *Мэв*	0,69	5,80	0,006	—	5,79	0,06	0,0366	0,307
9	46,5—100 *кэв*	0,77	6,40	0,008	—	6,39	0,03	0,0377	0,313
10	21,5—46,5 *кэв*	0,77	2,90	0,010	—	2,89	0,02	0,0381	0,143
11	10,0—21,5 *кэв*	0,77	4,40	0,013	—	4,39	0,01	0,0385	0,220
12	4,65—10,0 *кэв*	0,77	18,0	0,020	—	18,0	0,01	0,0385	0,900
13	2,15—4,65 *кэв*	0,77	11,0	0,030	—	11,0	0,01	0,0385	0,550
14	1,0—2,15 *кэв*	0,77	4,70	0,050	—	4,65	0,01	0,0385	0,233
15	465—1000 *эв*	0,77	4,70	0,080	—	4,62	0,01	0,0385	0,231
16	215—465 *эв*	0,77	4,23	0,030	—	4,20	0,01	0,0385	0,210
17	100—215 *эв*	0,77	4,24	0,041	—	4,20	0,01	0,0385	0,210
18	46,5—100 *эв*	0,77	4,26	0,060	—	4,20	0,01	0,0385	0,210
19	21,5—46,5 *эв*	0,77	4,29	0,087	—	4,20	0,01	0,0385	0,210
20	10,0—21,5 *эв*	0,77	4,33	0,129	—	4,20	0,01	0,0385	0,210
21	4,65—10 *эв*	0,77	4,39	0,189	—	4,20	0,01	0,0385	0,210
22	2,15—4,65 *эв*	0,77	4,48	0,280	—	4,20	0,01	0,0385	0,210
23	1,0—2,15 *эв*	0,77	4,61	0,410	—	4,20	0,01	0,0385	0,210
24	0,465—1,0 *эв*	0,77	4,80	0,600	—	4,20	0,01	0,0385	0,210
25	0,215—0,465 *эв*	0,77	5,07	0,870	—	4,20	0,01	0,0385	0,210
T	0,0252 *эв*	—	7,30	3.100	—	4,20	0,01	—	—

i	$\sigma_{in}(i, i+k)$ при k, равном								
	0	1	2	3	4	5	6	7	8
1	0,01	0,08	0,22	0,39	0,30	0,19	0,07	0,03	0,01
2	0,07	0,40	0,29	0,24	0,16	0,06	0,02	0,01	—
3	0,02	0,29	0,68	0,07	0,03	0,01	—	—	—
4	0,01	0,24	0,30	0,13	0,04	0,01	—	—	—
5	0,01	0,02	0,01	—	—	—	—	—	—

i	f_c при σ_0, равной					f_t при σ_0, равной				f_e при σ_0, равной			
	∞	10^3	10^2	10	0	∞	10^2	10	0	∞	10^2	10	0
8	1,00	1,00	0,98	0,80	—	1,00	0,97	0,87	—	1,00	0,98	0,93	—
9	1,00	1,00	0,98	0,78	—	1,00	0,89	0,56	—	1,00	0,94	0,72	—
10	1,00	1,00	0,98	0,71	—	1,00	1,00	0,96	—	1,00	1,00	0,98	—
11	1,00	1,00	0,96	0,62	—	1,00	1,00	0,93	—	1,00	1,00	0,96	—
12	1,00	1,00	0,97	0,82	—	1,00	0,97	0,92	—	1,00	0,98	0,95	—
13	1,00	0,98	0,91	0,76	—	1,00	0,94	0,73	—	1,00	0,97	0,84	—
14	1,00	0,96	0,75	0,40	—	1,00	1,0	1,0	—	1,00	1,0	1,0	—
15	1,00	0,93	0,81	0,30	—	1,00	1,0	1,0	—	1,00	1,0	1,0	—

Iron (Fe)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{3\,(r)}$
1	6,5—10,5 *Мэв*	0,48	3,40	0,036	1,37	1,99	0,83	0,0061	0,061
2	4,0—6,5 *Мэв*	0,48	3,80	0,005	1,35	2,45	0,72	0,0100	0,082
3	2,5—4,0 *Мэв*	0,48	3,50	0,002	1,13	2,37	0,45	0,0196	0,114
4	1,4—2,5 *Мэв*	0,57	3,30	0,003	0,90	2,40	0,32	0,0242	0,102
5	0,8—1,4 *Мэв*	0,57	2,90	0,004	0,37	2,53	0,24	0,0271	0,120
6	0,4—0,8 *Мэв*	0,69	3,80	0,005	0,01	3,78	0,17	0,0296	0,162
7	0,2—0,4 *Мэв*	0,69	3,00	0,006	—	2,99	0,08	0,0328	0,142
8	0,1—0,2 *Мэв*	0,69	3,70	0,006	—	3,69	0,05	0,0339	0,181
9	46,5—100 *кэв*	0,77	5,30	0,007	—	5,29	0,03	0,0346	0,238
10	21,5—46,5 *кэв*	0,77	14,5	0,017	—	14,5	0,02	0,0349	0,657
11	10,0—21,5 *кэв*	0,77	4,00	0,005	—	3,99	0,01	0,0353	0,183
12	4,65—10,0 *кэв*	0,77	8,40	0,004	—	8,40	0,01	0,0353	0,385
13	2,15—4,65 *кэв*	0,77	5,90	0,011	—	5,89	0,01	0,0353	0,270
14	1,0—2,15 *кэв*	0,77	7,50	0,106	—	7,39	0,01	0,0353	0,339
15	465—1000 *эв*	0,77	10,0	0,015	—	10,0	0,01	0,0353	0,459
16	215—465 *эв*	0,77	11,0	0,028	—	11,0	0,01	0,0353	0,504
17	100—215 *эв*	0,77	11,4	0,037	—	11,4	0,01	0,0353	0,523
18	46,5—100 *эв*	0,77	11,5	0,053	—	11,4	0,01	0,0353	0,523
19	21,5—46,5 *эв*	0,77	11,5	0,072	—	11,4	0,01	0,0353	0,523
20	10,0—21,5 *эв*	0,77	11,5	0,105	—	11,4	0,01	0,0353	0,523
21	4,65—10 *эв*	0,77	11,6	0,154	—	11,4	0,01	0,0353	0,523
22	2,15—4,65 *эв*	0,77	11,6	0,220	—	11,4	0,01	0,0353	0,523
23	1,0—2,15 *эв*	0,77	11,7	0,330	—	11,4	0,01	0,0353	0,523
24	0,465—1,0 *эв*	0,77	11,9	0,490	—	11,4	0,01	0,0353	0,523
25	0,215—0,465 *эв*	0,77	12,1	0,720	—	11,4	0,01	0,0353	0,523
T	0,0252 *эв*	—	13,9	2,530	—	11,4	0,01	—	—

i	$\sigma_{in\,(i,\,i+k)}$ при k, равном								
	0	1	2	3	4	5	6	7	8
1	0,01	0,08	0,19	0,40	0,34	0,22	0,08	0,04	0,01
2	0,12	0,22	0,31	0,33	0,23	0,10	0,03	0,01	—
3	0,18	0,60	0,14	0,13	0,05	0,03	—	—	—
4	0,15	0,46	0,25	0,03	0,01	—	—	—	—
5	0,01	0,15	0,15	0,05	0,01	—	—	—	—
6	0,01	—	—	—	—	—	—	—	—

i	f_c при σ_0, равной					f_t при σ_0, равной				f_e при σ_0, равной			
	∞	10^4	10	1	0	∞	10	1	0	∞	10	1	0
2	1,00	1,00	1,00	0,98	0,97	1,00	0,99	0,98	0,96	1,00	1,00	0,99	0,98
3	1,00	1,00	0,99	0,97	0,95	1,00	0,98	0,95	0,94	1,00	0,99	0,97	0,96
4	1,00	1,00	0,98	0,92	0,90	1,00	0,94	0,81	0,74	1,00	0,97	0,90	0,87
5	1,00	0,99	0,92	0,83	0,79	1,00	0,91	0,73	0,61	1,00	0,95	0,86	0,79
6	1,00	0,98	0,82	0,70	0,63	1,00	0,82	0,59	0,45	1,00	0,90	0,75	0,68
7	1,00	0,98	0,82	0,69	0,62	1,00	0,92	0,71	0,55	1,00	0,96	0,85	0,77
8	1,00	0,97	0,79	0,55	0,50	1,00	0,85	0,57	0,39	1,00	0,92	0,76	0,66
9	1,00	0,90	0,70	0,57	0,53	1,00	0,77	0,49	0,34	1,00	0,86	0,70	0,60
10	1,00	0,66	0,52	0,32	0,39	1,00	0,25	0,07	0,03	1,00	0,37	0,15	0,07
11	1,00	0,98	0,88	0,80	0,75	1,00	1,00	1,0	1,0	1,00	1,00	1,0	1,0
12	1,00	0,95	0,76	0,64	0,60	1,00	0,98	0,95	0,86	1,00	0,97	0,84	0,76
13	1,00	0,98	0,88	0,80	0,77	1,00	1,00	1,0	1,0	1,00	1,00	1,0	1,0
14	1,00	0,78	0,49	0,39	0,37	1,00	1,00	1,0	1,0	1,00	1,00	1,0	1,0

Nickel (Ni)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{2(r)}$
1	6,5—10,5 Мэв	0,48	3,50	0,230	1,27	2,00	0,80	0,0068	0,069
2	4,0—6,5 Мэв	0,48	3,60	0,190	1,30	2,11	0,73	0,0091	0,064
3	2,5—4,0 Мэв	0,48	3,30	0,135	1,00	2,16	0,45	0,0186	0,099
4	1,4—2,5 Мэв	0,57	3,10	0,072	0,50	2,53	0,30	0,0237	0,105
5	0,8—1,4 Мэв	0,57	3,15	0,030	—	3,12	0,14	0,0291	0,159
6	0,4—0,8 Мэв	0,69	3,95	0,011	—	3,94	0,14	0,0291	0,166
7	0,2—0,4 Мэв	0,69	5,50	0,009	—	5,49	0,09	0,0308	0,245
8	0,1—0,2 Мэв	0,69	4,60	0,010	—	4,59	0,04	0,0325	0,216
9	46,5—100 кэв	0,77	7,50	0,016	—	7,48	0,03	0,0328	0,319
10	21,5—46,5 кэв	0,77	10,9	0,016	—	10,9	0,01	0,0335	0,474
11	10,0—21,5 кэв	0,77	28,7	0,033	—	28,7	0,01	0,0335	1,25
12	4,65—10,0 кэв	0,77	14,0	0,018	—	14,0	0,01	0,0335	0,609
13	2,15—4,65 кэв	0,77	20,0	0,048	—	20,0	0,01	0,0335	0,870
14	1,0—2,15 кэв	0,77	13,4	0,019	—	13,4	0,01	0,0335	0,583
15	465—1000 эв	0,77	15,5	0,028	—	15,5	0,01	0,0335	0,674
16	215—465 эв	0,77	17,0	0,041	—	17,0	0,01	0,0335	0,740
17	100—215 эв	0,77	17,1	0,061	—	17,0	0,01	0,0335	0,740
18	46,5—100 эв	0,77	17,1	0,089	—	17,0	0,01	0,0335	0,740
19	21,5—46,5 эв	0,77	17,1	0,131	—	17,0	0,01	0,0335	0,740
20	10,0—21,5 эв	0,77	17,2	0,193	—	17,0	0,01	0,0335	0,740
21	4,65—10 эв	0,77	17,3	0,283	—	17,0	0,01	0,0335	0,740
22	2,15—4,65 эв	0,77	17,4	0,414	—	17,0	0,01	0,0335	0,740
23	1,0—2,15 эв	0,77	17,6	0,608	—	17,0	0,01	0,0335	0,740
24	0,465—1,0 эв	0,77	17,9	0,894	—	17,0	0,01	0,0335	0,740
25	0,215—0,465 эв	0,77	18,3	1,314	—	17,0	0,01	0,0335	0,740
T	0,0252 эв	—	21,6	4,600	—	17,0	0,01	0,0335	—

i	$\sigma_{in(i,\,i+k)}$ при k, равном								
	0	1	2	3	4	5	6	7	8
1	0,01	0,05	0,18	0,37	0,32	0,22	0,08	0,03	0,01
2	0,03	0,28	0,31	0,33	0,22	0,09	0,03	0,01	—
3	0,03	0,36	0,31	0,17	0,09	0,03	0,01	—	—
4	0,00	0,13	0,20	0,10	0,05	0,02	—	—	—

i	f_c при σ_0, равной					f_t при σ_0, равной				f_e при σ_0, равной			
	∞	10^2	10^1	1	0	∞	10	1	0	∞	10	1	0
2	1,00	1,00	1,00	0,99	0,98	1,00	1,00	0,98	0,96	1,00	1,00	0,99	0,98
3	1,00	1,00	1,00	0,98	0,96	1,00	0,99	0,96	0,94	1,00	1,00	0,98	0,96
4	1,00	1,00	0,99	0,95	0,94	1,00	0,97	0,90	0,86	1,00	0,99	0,95	0,93
5	1,00	1,00	0,96	0,91	0,88	1,00	0,94	0,78	0,66	1,00	0,98	0,91	0,85
6	1,00	0,99	0,89	0,75	0,67	1,00	0,83	0,64	0,53	1,00	0,90	0,78	0,72
7	1,00	0,99	0,87	0,71	0,66	1,00	0,77	0,55	0,47	1,00	0,88	0,72	0,67
8	1,00	0,98	0,81	0,58	0,53	1,00	0,77	0,49	0,36	1,00	0,90	0,69	0,60
9	1,00	0,98	0,78	0,60	0,59	1,00	0,78	0,62	0,53	1,00	0,87	0,76	0,73
10	1,00	0,93	0,73	0,59	0,57	1,00	0,90	0,84	0,83	1,00	0,94	0,91	0,90
11	1,00	0,84	0,62	0,34	0,32	1,00	0,30	0,15	0,13	1,00	0,57	0,34	0,30
12	1,00	1,00	0,90	0,85	0,85	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
13	1,00	0,98	0,64	0,55	0,54	1,00	0,89	0,87	0,87	1,00	0,93	0,92	0,92

Copper (Cu)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{a(e)}$
1	6,5—10,5 *Мэв*	0,48	3,70	0,040	1,56	2,10	0,80	0,0062	0,066
2	4,0—6,5 *Мэв*	0,48	3,90	0,014	1,59	2,30	0,73	0,0084	0,065
3	2,5—4,0 *Мэв*	0,48	3,40	0,005	1,45	1,94	0,52	0,0150	0,071
4	1,4—2,5 *Мэв*	0,57	3,20	0,006	0,80	2,39	0,29	0,0222	0,093
5	0,8—1,4 *Мэв*	0,57	3,50	0,010	0,20	3,29	0,16	0,0262	0,151
6	0,4—0,8 *Мэв*	0,69	4,20	0,014	—	4,19	0,11	0,0278	0,169
7	0,2—0,4 *Мэв*	0,69	5,00	0,020	—	4,98	0,07	0,0290	0,209
8	0,1—0,2 *Мэв*	0,69	5,20	0,028	—	5,17	0,04	0,0300	0,226
9	46,5—100 *кэв*	0,77	6,00	0,040	—	5,96	0,02	0,0306	0,237
10	21,5—46,5 *кэв*	0,77	8,00	0,090	—	7,91	0,01	0,0309	0,317
11	10,0—21,5 *кэв*	0,77	9,50	0,14	—	9,36	0,01	0,0309	0,376
12	4,65—10,0 *кэв*	0,77	10,0	0,24	—	9,76	0,01	0,0309	0,392
13	2,15—4,65 *кэв*	0,77	9,90	0,24	—	9,66	0,01	0,0309	0,388
14	1,0—2,15 *кэв*	0,77	24,9	0,36	—	24,5	0,01	0,0309	0,983
15	465—1000 *эв*	0,77	11,1	1,70	—	9,40	0,01	0,0309	0,377
16	215—465 *эв*	0,77	7,08	0,28	—	6,80	0,01	0,0309	0,273
17	100—125 *эв*	0,77	7,12	0,020	—	7,10	0,01	0,0309	0,285
18	46,5—100 *эв*	0,77	7,35	0,047	—	7,30	0,01	0,0309	0,293
19	21,5—46,5 *эв*	0,77	7,48	0,080	—	7,40	0,01	0,0309	0,297
20	10,0—21,5 *эв*	0,77	7,65	0,15	—	7,50	0,01	0,0309	0,301
21	4,65—10 *эв*	0,77	7,83	0,23	—	7,60	0,01	0,0309	0,305
22	2,15—4,65 *эв*	0,77	8,04	0,34	—	7,70	0,01	0,0309	0,309
23	1,0—2,15 *эв*	0,77	8,30	0,50	—	7,80	0,01	0,0309	0,313
24	0,465—1,0 *эв*	0,77	8,54	0,74	—	7,80	0,01	0,0309	0,313
25	0,215—0,465 *эв*	0,77	8,88	1,08	—	7,80	0,01	0,0309	0,313
T	0,0252 *эв*	—	11,65	3,85	—	7,80	0,01	—	—

i	$\sigma_{in}(i, i+k)$ при k, равном								
	0	1	2	3	4	5	6	7	8
1	0,01	0,06	0,22	0,46	0,41	0,26	0,10	0,03	0,01
2	0,05	0,21	0,46	0,42	0,30	0,11	0,03	0.01	—
3	0,15	0,45	0,39	0,28	0,13	0,04	0,01	—	—
4	0,15	0,43	0,20	0,02	—	—	—	—	—
5	0,00	0,09	0,08	0,02	0,01	—	—	—	—

i	f_c при σ_0, равной					f_t при σ_0, равной				f_e при σ_0, равной			
	∞	10^3	10^2	10	0	∞	10^2	10	0	∞	10^2	10	0
5	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
6	1,00	1,00	1,00	0,99	0,93	1,00	1,00	0,99	0,91	1,00	1,00	1,00	0,96
7	1,00	1,00	1,00	0,98	0,84	1,00	1,00	0,98	0,86	1,00	1,00	0,99	0,92
8	1,00	1,00	0,98	0,87	0,72	1,00	0,97	0,87	0,75	1,00	0,99	0,92	0,83
9	1,00	1,00	0,94	0,71	0,50	1,00	0,90	0,78	0,65	1,00	0,95	0,85	0,75
10	1,00	0,96	0,88	0,57	0,41	1,00	0,85	0,63	0,55	1,00	0,91	0,75	0,60
11	1,00	0,99	0,92	0,70	0,33	1,00	0,70	0,48	0,36	1,00	0,75	0,60	0,45
12	1,00	0,97	0,89	0,65	0,43	1,00	0,73	0,55	0,44	1,00	0,82	0,63	0,51
13	1,00	0,97	0,82	0,63	0,50	1,00	0,77	0,65	0,62	1,00	0,84	0,70	0,66
14	1,00	0,89	0,63	0,49	0,44	1,00	0,44	0,30	0,25	1,00	0,56	0,37	0,28
15	1,00	0,74	0,35	0,14	0,09	1,00	0,72	0,68	0,67	1,00	0,78	0,69	0,69
16	1,00	0,97	0,80	0,46	0,30	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00

Zirconium (Zr)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{\text{э}}$ (e)
1	6,5—10,5 *Мэв*	0,48	4,20	0,010	1,75	2,44	0,75	0,0055	0,068
2	4,0—6,5 *Мэв*	0,48	3,90	0,004	1,65	2,25	0,58	0,0092	0,069
3	2,5—4,0 *Мэв*	0,48	4,30	0,004	1,35	2,95	0,43	0,0126	0,091
4	1,4—2,5 *Мэв*	0,57	5,00	0,005	0,73	4,27	0,37	0,0139	0,104
5	0,8—1,4 *Мэв*	0,57	6,80	0,010	0,20	6,59	0,36	0,0141	0,163
6	0,4—0,8 *Мэв*	0,69	8,50	0,013	0,00	8,49	0,27	0,0161	0,198
7	0,2—0,4 *Мэв*	0,69	7,80	0,013	—	7,79	0,14	0,0190	0,214
8	0,1—0,2 *Мэв*	0,69	8,80	0,014	—	8,79	0,08	0,0203	0,259
9	46,5—100 *кэв*	0,77	8,20	0,018	—	8,18	0,04	0,0211	0,224
10	21,5—46,5 *кэв*	0,77	9,40	0,022	—	9,38	0,02	0,0216	0,263
11	10,0—21,5 *кэв*	0,77	7,80	0,027	—	7,77	0,01	0,0218	0,220
12	4,65—10,0 *кэв*	0,77	9,00	0,030	—	8,97	0,01	0,0218	0,254
13	2,15—4,65 *кэв*	0,77	8,00	0,035	—	7,96	0,01	0,0218	0,225
14	1,0—2,15 *кэв*	0,77	7,18	0,047	—	7,13	0,01	0,0218	0,202
15	465—1000 *эв*	0,77	6,52	0,163	—	6,36	0,01	0,0218	0,180
16	215—465 *эв*	0,77	8,88	0,980	—	7,90	0,01	0,0218	0,224
17	100—215 *эв*	0,77	6,29	0,093	—	6,20	0,01	0,0218	0,176
18	46,5—100 *эв*	0,77	6,20	0,004	—	6,20	0,01	0,0218	0,176
19	21,5—46,5 *эв*	0,77	6,20	0,005	—	6,20	0,01	0,0218	0,176
20	10,0—21,5 *эв*	0,77	6,21	0,008	—	6,20	0,01	0,0218	0,176
21	4,65—10 *эв*	0,77	6,21	0,011	—	6,20	0,01	0,0218	0,176
22	2,15—4,65 *эв*	0,77	6,22	0,016	—	6,20	0,01	0,0218	0,176
23	1,0—2,15 *эв*	0,77	6,22	0,024	—	6,20	0,01	0,0218	0,176
24	0,465—1,0 *эв*	0,77	6,24	0,036	—	6,20	0,01	0,0218	0,176
25	0,215—0,465 *эв*	0,77	6,25	0,052	—	6,20	0,01	0,0218	0,176
T	0,0252 *эв*	—	6,38	0,185	—	6,20	0,01	—	—

l	$a_{in}(l, l+k)$ при k, равном								
	0	1	2	3	4	5	6	7	8
1	0,00	0,02	0,10	0,42	0,51	0,44	0,19	0,05	0,02
2	0,01	0,06	0,33	0,46	0,46	0,21	0,08	0,03	0,01
3	0,10	0,40	0,31	0,30	0,13	0,03	0,02	—	—
4	0,07	0,25	0,29	0,08	0,03	0,01	—	—	—
5	0,00	0,05	0,10	0,04	0,01	—	—	—	—

l	T°K	I_c при σ_e, равной					I_t при σ_e, равной				I_e при σ_e, равной			
		∞	10^4	10^2	10	0	10^4	10^2	10	0	10^4	10^2	10	0
10	300	1,00	1,00	1,00	0,96	0,87	1,00	0,98	0,93	0,85	1,00	0,98	0,95	0,93
	900	1,00	1,00	1,00	0,97	0,90	1,00	0,98	0,93	0,85	1,00	0,98	0,95	0,93
	2100	1,00	1,00	1,00	0,97	0,93	1,00	0,98	0,93	0,85	1,00	0,98	0,95	0,93
11	300	1,00	1,00	0,99	0,89	0,78	1,00	0,97	0,92	0,85	1,00	0,98	0,94	0,92
	900	1,00	1,00	0,99	0,91	0,82	1,00	0,97	0,92	0,85	1,00	0,98	0,94	0,92
	2100	1,00	1,00	1,00	0,94	0,86	1,00	0,97	0,92	0,85	1,00	0,98	0,94	0,92
12	300	1,00	1,00	0,96	0,81	0,68	1,00	0,96	0,91	0,85	1,00	0,97	0,93	0,91
	900	1,00	1,00	0,98	0,85	0,73	1,00	0,96	0,91	0,85	1,00	0,97	0,93	0,91
	2100	1,00	1,00	0,99	0,89	0,78	1,00	0,96	0,91	0,85	1,00	0,97	0,93	0,91
13	300	1,00	0,97	0,82	0,53	0,40	1,00	0,95	0,89	0,86	1,00	0,96	0,92	0,90
	900	1,00	0,98	0,83	0,55	0,42	1,00	0,95	0,89	0,86	1,00	0,96	0,92	0,90
	2100	1,00	0,98	0,87	0,57	0,45	1,00	0,95	0,89	0,86	1,00	0,96	0,92	0,90
14	300	1,00	0,96	0,75	0,39	0,25	0,99	0,93	0,87	0,86	0,99	0,96	0,90	0,88
	900	1,00	0,96	0,75	0,39	0,25	0,93	0,93	0,87	0,86	0,99	0,96	0,90	0,88
	2100	1,00	0,96	0,75	0,39	0,25	0,99	0,93	0,87	0,86	0,99	0,96	0,90	0,88
15	300	1,00	0,95	0,69	0,32	0,19	0,99	0,96	0,93	0,93	1,00	0,98	0,96	0,95
	900	1,00	0,97	0,75	0,36	0,21	0,99	0,97	0,91	0,93	1,00	0,99	0,97	0,96
	2100	1,00	0,98	0,79	0,40	0,23	0,99	0,97	0,94	0,93	1,00	0,99	0,97	0,96
16	300	1,00	0,89	0,55	0,25	0,16	0,93	0,79	0,72	0,71	0,97	0,89	0,82	0,80
	900	1,00	0,90	0,58	0,27	0,17	0,94	0,80	0,72	0,71	0,98	0,90	0,82	0,80
	2100	1,00	0,92	0,63	0,29	0,18	0,95	0,81	0,73	0,71	0,98	0,91	0,83	0,81
17	300	1,00	1,00	0,83	0,73	0,54	1,00	1,00	0,99	0,99	1,00	1,00	1,00	1,00
	900	1,00	1,00	0,85	0,79	0,60	1,00	1,00	0,99	0,99	1,00	1,00	1,00	1,00
	2100	1,00	1,00	0,97	0,84	0,66	1,00	1,00	1,00	0,99	1,00	1,00	1,00	1,00

Niobium (Nb)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{3(e)}$
1	6,5—10,5 *Мэв*	0,48	4,00	0,005	1,80	2,19	0,75	0,054	0,0600
2	4,0—6,5 *Мэв*	0,48	3,90	0,005	1,90	2,00	0,67	0,0071	0,0476
3	2,5—4,0 *Мэв*	0,48	4,50	0,008	1,95	2,54	0,60	0,0086	0,0537
4	1,4—2,5 *Мэв*	0,57	5,60	0,010	1,80	3,79	0,50	0,0108	0,0718
5	0,8—1,4 *Мэв*	0,57	7,00	0,030	0,95	6,02	0,39	0,0132	0,139
6	0,4—0,8 *Мэв*	0,69	8,50	0,055	0,05	8,40	0,28	0,0156	0,190
7	0,2—0,4 *Мэв*	0,69	9,00	0,070	0,03	8,90	0,17	0,0179	0,231
8	0,1—0,2 *Мэв*	0,69	9,00	0,110	—	8,89	0,09	0,0197	0,254
9	46,5—100 *кэв*	0,77	8,40	0,16	—	8,24	0,05	0,0205	0,219
10	21,5—46,5 *кэв*	0,77	7,70	0,30	—	7,40	0,03	0,0210	0,202
11	10,0—21,5 *кэв*	0,77	7,40	0,55	—	6,85	0,02	0,0212	0,189
12	4,65—10,0 *кэв*	0,77	8,50	1,10	—	7,40	0,01	0,0214	0,206
13	2,15—4,65 *кэв*	0,77	9,80	2,00	—	7,80	0,01	0,0214	0,217
14	1,0—2,15 *кэв*	0,77	12,3	3,40	—	8,90	0,01	0,0214	0,247
15	465—1000 *эв*	0,77	9,32	1,87	—	7,45	0,01	0,0214	0,207
16	215—465 *эв*	0,77	8,98	2,38	—	6,60	0,01	0,0214	0,183
17	100—215 *эв*	0,77	9,62	3,32	—	6,30	0,01	0,0214	0,175
18	46,5—100 *эв*	0,77	6,32	0,12	—	6,20	0,01	0,0214	0,172
19	21,5—46,5 *эв*	0,77	7,03	0,53	—	6,50	0,01	0,0214	0,181
20	10,0—21,5 *эв*	0,77	6,55	0,05	—	6,50	0,01	0,0214	0,181
21	4,65—10 *эв*	0,77	6,57	0,07	—	6,50	0,01	0,0214	0,181
22	2,15—4,65 *эв*	0,77	6,60	0,10	—	6,50	0,01	0,0214	0,181
23	1,0—2,15 *эв*	0,77	6,65	0,15	—	6,50	0,01	0,0214	0,181
24	0,465—1,0 *эв*	0,77	6,72	0,22	—	6,50	0,01	0,0214	0,181
25	0,215—0,465 *эв*	0,77	6,82	0,32	—	6,50	0,01	0,0214	0,181
T	0,0252 *эв*	—	7,66	1,16	—	6,50	0,01	—	—

i	$\sigma_{in(i,\,i+k)}$ при k, равном								
	0	1	2	3	4	5	6	7	8
1	0,00	0,02	0,11	0,43	0,52	0,45	0,20	0,05	0,02
2	0,02	0,08	0,40	0,50	0,55	0,24	0,09	0,02	—
3	0,15	0,45	0,50	0,40	0,31	0,11	0,03	—	—
4	0,25	0,44	0,48	0,40	0,18	0,05	—	—	—
5	0,14	0,15	0,39	0,17	0,08	0,02	—	—	—
6	0,04	0,01	—	—	—	—	—	—	—
7	0,02	0,01	—	—	—	—	—	—	—

l	T°K	f_c при σ_e, равной					f_t при σ_e, равной				f_e при σ_e, равной			
		∞	10^3	10^2	10	0	10^3	10^2	10	0	10^3	10^2	10	0
10	300	1,00	1,00	1,00	0,99	0,96	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
	900	1,00	1,00	1,00	0,99	0,98	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
	2100	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
11	300	1,00	1,00	0,99	0,90	0,80	1,00	0,98	0,96	0,90	1,00	1,00	0,98	0,97
	900	1,00	1,00	0,99	0,97	0,90	1,00	0,99	0,98	0,95	1,00	1,00	0,99	0,98
	2100	1,00	1,00	1,00	0,99	0,98	1,00	1,00	0,99	0,98	1,00	1,00	1,00	0,99
12	300	1,00	1,00	0,95	0,76	0,62	1,00	0,96	0,88	0,80	1,00	0,99	0,96	0,93
	900	1,00	1,00	0,97	0,87	0,75	1,00	0,97	0,91	0,86	1,00	0,99	0,98	0,96
	2100	1,00	1,00	0,98	0,98	0,84	1,00	0,99	0,97	0,89	1,00	1,00	0,99	0,97
13	300	1,00	0,97	0,89	0,60	0,40	1,00	0,94	0,76	0,70	1,00	0,98	0,93	0,89
	900	1,00	0,99	0,94	0,70	0,53	1,00	0,96	0,81	0,72	1,00	0,99	0,95	0,91
	2100	1,00	1,00	0,97	0,80	0,64	1,00	0,98	0,89	0,77	1,00	0,99	0,96	0,94
14	300	1,00	0,92	0,71	0,43	0,28	0,95	0,84	0,73	0,68	0,98	0,93	0,88	0,86
	900	1,00	0,96	0,77	0,51	0,36	0,97	0,83	0,76	0,70	0,99	0,91	0,90	0,87
	2100	1,00	0,98	0,81	0,56	0,43	0,98	0,89	0,80	0,73	0,99	0,95	0,90	0,89
15	300	1,00	0,88	0,55	0,30	0,21	0,89	0,75	0,70	0,67	0,96	0,88	0,84	0,83
	900	1,00	0,92	0,62	0,35	0,24	0,93	0,77	0,71	0,68	0,97	0,90	0,84	0,83
	2100	1,00	0,94	0,66	0,39	0,27	0,95	0,80	0,72	0,69	0,98	0,91	0,85	0,83
16	300	1,00	0,86	0,52	0,20	0,11	0,89	0,77	0,71	0,69	0,98	0,95	0,93	0,92
	900	1,00	0,91	0,57	0,28	0,18	0,92	0,79	0,72	0,69	0,98	0,95	0,93	0,92
	2100	1,00	0,92	0,60	0,33	0,24	0,94	0,81	0,75	0,70	0,99	0,96	0,93	0,92
17	300	1,00	0,87	0,52	0,19	0,10	0,89	0,74	0,67	0,65	0,98	0,97	0,96	0,96
	900	1,00	0,90	0,58	0,27	0,17	0,92	0,77	0,67	0,65	0,99	0,97	0,96	0,96
	2100	1,00	0,92	0,59	0,35	0,20	0,94	0,80	0,68	0,66	0,99	0,98	0.97	0,96
18	300	1,00	1,00	0,84	0,76	0,56	1,00	1,00	0,99	0,99	1,00	1,00	1,00	1,00
	900	1,00	1,00	0,88	0,81	0,65	1,00	1,00	0,99	0,99	1,00	1,00	1,00	1,00
	2100	1,00	1,00	0,90	0,86	0,70	1,00	1,00	0,99	0,99	1,00	1,00	1,00	1,00
19	300	1,00	1,00	0,91	0,74	0,56	1,00	0,99	0,97	0,95	1,00	1,00	1,00	1,00
	900	1,00	1,00	0,93	0,80	0,64	1,00	0,99	0,97	0,96	1,00	1,00	1,00	1,00
	2100	1,00	1,00	0,96	0,84	0,70	1,00	0,99	0,98	0,97	1,00	1,00	1,00	1,00

Molybdenum **(Mo)**

i	E_n	Δu	σ_f	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{3}(e)$
1	6,5—10,5 *Мэв*	0,48	4,10	0,020	1,85	2,23	0,75	0,0052	0,059
2	4,0—6,5 *Мэв*	0,48	3,90	0,007	1,92	1,97	0,65	0,0073	0,048
3	2,5—4,0 *Мэв*	0,48	4,10	0,015	1,97	2,12	0,55	0,0094	0,049
4	1,4—2,5 *Мэв*	0,57	5,40	0,020	1,65	3,73	0,46	0,0113	0,074
5	0,8—1,4 *Мэв*	0,57	6,50	0,028	0,75	5,72	0,42	0,0121	0,121
6	0,4—0,8 *Мэв*	0,69	8,00	0,042	0,15	7,81	0,31	0,0144	0,163
7	0,2—0,4 *Мэв*	0,69	8,90	0,052	0,04	8,81	0,20	0,0167	0,213
8	0,1—0,2 *Мэв*	0,69	9,00	0,070	0,00	8,93	0,11	0,0186	0,241
9	46,5—100 *кэв*	0,77	8,20	0,100	—	8,10	0,07	0,0194	0,204
10	21,5—46,5 *кэв*	0,77	7,60	0,150	—	7,45	0,04	0,0200	0,194
11	10,0—21,5 *кэв*	0,77	7,20	0,26	—	6,94	0,02	0,0205	0,185
12	4,65—10,0 *кэв*	0,77	7,50	0,45	—	7,05	0,01	0,0207	0,190
13	2,15—4,65 *кэв*	0,77	8,50	0,55	—	7,95	0,01	0,0207	0,214
14	1,0—2,15 *кэв*	0,77	10,0	0,70	—	9,30	0,01	0,0207	0,250
15	465—1000 *эв*	0,77	11,2	1,70	—	9,50	0,01	0,0207	0,255
16	215—465 *эв*	0,77	10,2	1,50	—	8,70	0,01	0,0207	0,234
17	100—215 *эв*	0,77	11,2	3,30	—	7,90	0,01	0,0207	0,212
18	46,5—100 *эв*	0,77	25,0	11,0	—	14,0	0,01	0,0207	0,376
19	21,5—46,5 *эв*	0,77	24,0	10,0	—	14,0	0,01	0,0207	0,376
20	10,0—21,5 *эв*	0,77	6,14	0,64	—	5,50	0,01	0,0207	0,148
21	4,65—10 *эв*	0,77	5,66	0,16	—	5,50	0,01	0,0207	0,148
22	2,15—4,65 *эв*	0,77	5,74	0,24	—	5,50	0,01	0,0207	0,148
23	1,0—2,15 *эв*	0,77	5,85	0,35	—	5,50	0,01	0,0207	0,148
24	0,465—1,0 *эв*	0,77	6,02	0,52	—	5,50	0,01	0,0207	0,148
25	0,215—0,465 *эв*	0,77	6,26	0,76	—	5,50	0,01	0,0207	0,148
T	0,0252 *эв*	—	8,20	2,70	—	5,50	0,01	—	—

i	$\sigma_{in}(i, i+k)$ при k, равном								
	0	1	2	3	4	5	6	7	8
1	0,00	0,02	0,11	0,43	0,56	0,46	0,20	0,05	0,02
2	0,00	0,06	0,35	0,55	0,55	0,27	0,10	0,03	0,01
3	0,10	0,40	0,42	0,54	0,33	0,14	0,03	0,01	—
4	0,16	0,40	0,50	0,30	0,20	0,07	0,02	—	—
5	0,07	0,27	0,24	0,11	0,06	—	—	—	—
6	0,05	0,08	0,02	—	—	—	—	—	—
7	0,00	0,03	0,01	—	—	—	—	—	—

i	T°K	f_c при σ_0, равной				f_t при σ_0, равной				f_e при σ_0, равной			
		10^3	10^2	10	0	10^3	10^2	10	0	10^3	10^2	10	0
12	300	1,00	0,98	0,94	0,90	1,00	0,96	0,91	0,84	1,00	0,98	0,93	0,89
	900	1,00	0,99	0,95	0,91	1,00	0,98	0,93	0,86	1,00	0,99	0,95	0,92
	2100	1,00	0,99	0,97	0,93	1,00	0,99	0,96	0,89	1,00	0,99	0,96	0,93
13	300	1,00	0,94	0,83	0,77	1,00	0,92	0,80	0,77	1,00	0,95	0,88	0,84
	900	1,00	0,96	0,86	0,79	1,00	0,93	0,83	0,78	1,00	0,98	0,90	0,85
	2100	1,00	0,98	0,88	0,82	1,00	0,94	0,86	0,79	1,00	0,99	0,92	0,86
14	300	0,98	0,88	0,69	0,62	0,98	0,84	0,70	0,67	0,98	0,94	0,84	0,79
	900	0,98	0,90	0,72	0,63	0,98	0,86	0,70	0,67	0,99	0,96	0,86	0,80
	2100	0,99	0,93	0,75	0,65	0,99	0,87	0,70	0,67	0,99	0,97	0,88	0,81
15	300	0,93	0,66	0,41	0,33	0,92	0,72	0,60	0,55	0,97	0,83	0,78	0,75
	900	0,95	0,72	0,43	0,34	0,93	0,72	0,60	0,56	0,98	0,85	0,79	0,75
	2100	0,97	0,77	0,47	0,38	0,93	0,73	0,61	0,56	0,99	0,89	0,80	0,76
16	300	0,88	0,59	0,36	0,28	0,96	0,88	0,85	0,84	0,99	0,97	0,96	0,95
	900	0,90	0,63	0,38	0,29	0,96	0,90	0,86	0,84	0,99	0,98	0,96	0,95
	2100	0,91	0,65	0,41	0,31	0,97	0,90	0,86	0,84	0,99	0,98	0,96	0,96
17	300	0,80	0,40	0,18	0,11	0,83	0,61	0,54	0,52	0,94	0,81	0,74	0,73
	900	0,87	0,44	0,19	0,12	0,86	0,62	0,54	0,52	0,96	0,82	0,75	0,73
	2100	0,88	0,49	0,23	0,13	0,87	0,63	0,55	0,52	0,96	0,84	0,76	0,74
18	300	0,64	0,28	0,13	0,08	0,62	0,41	0,36	0,35	0,83	0,66	0,60	0,59
	900	0,68	0,30	0,14	0,09	0,64	0,42	0,36	0,35	0,85	0,67	0,60	0,59
	2100	0,70	0,32	0,17	0,10	0,69	0,42	0,37	0,35	0,86	0,68	0,62	0,60
19	300	0,61	0,24	0,11	0,06	0,49	0,24	0,18	0,16	0,70	0,45	0,33	0,30
	900	0,65	0,26	0,11	0,08	0,52	0,24	0,18	0,17	0,74	0,44	0,33	0,31
	2100	0,68	0,27	0,14	0,09	0,58	0,24	0,19	0,17	0,76	0,45	0,35	0,32

Tantalum (Ta)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{э(e)}$
1	6,5—10,5 *Мэв*	0,48	5,0	0,01	2,50	2,49	0,83	0,00187	0,024
2	4,0—6,5 *Мэв*	0,48	5,7	0,03	2,70	2,97	0,78	0,00242	0,024
3	2,5—4,0 *Мэв*	0,48	6,8	0,04	2,80	3,96	0,70	0,00330	0,033
4	1,4—2,5 *Мэв*	0,57	7,4	0,10	2,80	4,50	0,60	0,00440	0,035
5	0,8—1,4 *Мэв*	0,57	7,5	0,14	2,25	5,11	0,45	0,00605	0,054
6	0,4—0,8 *Мэв*	0,69	7,8	0,20	1,35	6,25	0,32	0,00748	0,068
7	0,2—0,4 *Мэв*	0,69	8,0	0,27	0,60	7,13	0,19	0,00891	0,092
8	0,1—0,2 *Мэв*	0,69	8,4	0,32	0,24	7,84	0,11	0,00979	0,111
9	46,5—100 *кэв*	0,77	9,0	0,45	0,07	8,48	0,05	0,0104	0,115
10	21,5—46,5 *кэв*	0,77	10,0	0,8	0,03	9,2	0,02	0,01078	0,129
11	10,0—21,5 *кэв*	0,77	12,0	1,5	—	10,5	0,01	0,01089	0,148
12	4,65—10,0 *кэв*	0,77	15,0	2,9	—	12,1	0,00	0,0110	0,173
13	2,15—4,65 *кэв*	0,77	19,0	5,3	—	13,7	0,00	0,0110	0,196
14	1,0—2,15 *кэв*	0,77	25,0	9,6	—	15,4	0,00	0,0110	0,220

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{з(e)}$
15	465—1000 эв	0,77	34,0	16,7	—	17,3	0,00	0,0110	0,247
16	215—465 эв	0,77	47,0	28	—	19	0,00	0,0110	0,272
17	100—215 эв	0,77	64,0	32	—	32	0,00	0,0110	0,457
18	46,5—100 эв	0,77	64,0	32	—	32	0,00	0,0110	0,457
19	21,5—46,5 эв	0,77	157	104	—	53	0,00	0,0110	0,757
20	10,0—21,5 эв	0,77	123	111	—	12,4	0,00	0,0110	0,177
21	4,65—10 эв	0,77	23	16	—	7,0	0,00	0,0110	0,100
22	2,15—4,65 эв	0,77	520	483	—	37,0	0,00	0,0110	0,529
23	1,0—2,15 эв	0,77	10,2	4,2	—	6,0	0,00	0,0110	0,086
24	0,465—1,0 эв	0,77	10,9	4,9	—	6,0	0,00	0,0110	0,086
25	0,215—0,465 эв	0,77	12,4	6,4	—	6,0	0,00	0,0110	0,086
T	0,0252 эв	—	27,0	21	—	6,0	—	—	—

i	$\sigma_{in}(i, i+k)$ при k, равном								
	0	1	2	3	4	5	6	7	8
1	0,00	0,02	0,16	0,59	0,73	0,62	0,26	0,09	0,03
2	0,01	0,08	0,48	0,78	0,80	0,37	0,13	0,04	0,01
3	0,03	0,30	0,73	0,95	0,52	0,19	0,07	0,01	—
4	0,14	0,56	1,04	0,67	0,28	0,08	0,03	—	—
5	1,00	0,69	0,30	0,14	0,09	0,03	—	—	—
6	0,85	0,40	0,08	0,02	—	—	—	—	—
7	0,36	0,17	0,08	—	—	—	—	—	—
8	0,17	0,04	0,02	0,01	—	—	—	—	—
9	0,06	0,01	—	—	—	—	—	—	—
10	0,02	0,01	—	—	—	—	—	—	—

i	T°K	f_c при σ_0, равной						f_t при σ_0, равной				f_e при σ_0, равной			
		10^5	10^4	10^3	10^2	10	0	10^3	10^2	10	0	10^3	10^2	10	0
10	300	1,00	1,00	1,00	1,00	0,95	0,91	1,00	1,00	0,99	0,95	1,00	1,00	1,00	0,99
	900	1,00	1,00	1,00	1,00	0,98	0,96	1,00	1,00	1,00	0,97	1,00	1,00	1,00	1,00
	2100	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,99	1,00	1,00	1,00	1,00
11	300	1,00	1,00	0,98	0,91	0,83	0,75	1,00	0,96	0,90	0,89	1,00	0,97	0,95	0,92
	900	1,00	1,00	0,99	0,93	0,86	0,79	1,00	0,97	0,91	0,90	1,00	0,99	0,96	0,93
	2100	1,00	1,00	1,00	0,94	0,88	0,83	1,00	0,98	0,92	0,90	1,00	1,00	0,98	0,94
12	300	1,00	1,00	0,95	0,78	0,62	0,51	0,94	0,82	0,75	0,72	0,99	0,90	0,84	0,79
	900	1,00	1,00	0,97	0,80	0,66	0,55	0,95	0,83	0,76	0,73	1,00	0,92	0,85	0,81
	2100	1,00	1,00	0,98	0,82	0,67	0,57	0,96	0,85	0,77	0,74	1,00	0,93	0,86	0,83

i	T°K	f_c при σ_e, равной						f_t при σ_e, равной				f_e при σ_e, равной			
		10^5	10^4	10^3	10^2	10	0	10^3	10^2	10	0	10^3	10^2	10	0
13	300	1,00	1,00	0,91	0,65	0,40	0,35	0,88	0,64	0,55	0,52	0,96	0,81	0,66	0,60
	900	1,00	1,00	0,94	0,67	0,43	0,37	0,90	0,66	0,57	0,53	0,97	0,82	0,67	0,62
	2100	1,00	1,00	0,96	0,68	0,45	0,40	0,92	0,70	0,60	0,55	0,98	0,83	0,69	0,64
14	300	1,00	1,00	0,88	0,54	0,26	0,18	0,83	0,50	0,36	0,34	0,93	0,72	0,55	0,50
	900	1,00	1,00	0,91	0,60	0,30	0,21	0,85	0,55	0,37	0,35	0,95	0,76	0,57	0,51
	2100	1,00	1,00	0,95	0,67	0,35	0,31	0,88	0,62	0,38	0,37	0,97	0,80	0,60	0,57
15	300	1,00	1,00	0,86	0,50	0,22	0,15	0,80	0,43	0,30	0,28	0,89	0,66	0,50	0,46
	900	1,00	1,00	0,90	0,58	0,28	0,19	0,85	0,50	0,32	0,29	0,92	0,71	0,53	0,47
	2100	1,00	1,00	0,94	0,67	0,35	0,27	0,88	0,57	0,34	0,30	0,95	0,76	0,56	0,52
16	300	1,00	1,00	0,84	0,45	0,18	0,12	0,76	0,36	0,24	0,21	0,85	0,59	0,44	0,41
	900	1,00	1,00	0,89	0,56	0,26	0,17	0,84	0,44	0,26	0,22	0,89	0,65	0,48	0,43
	2100	1,00	1,00	0,93	0,66	0,34	0,23	0,87	0,51	0,30	0,23	0,92	0,70	0,51	0,46
17	300	1,00	1,00	0,67	0,32	0,13	0,08	0,63	0,22	0,15	0,13	0,70	0,40	0,27	0,24
	900	1,00	1,00	0,78	0,41	0,18	0,11	0,74	0,27	0,17	0,14	0,80	0,47	0,30	0,28
	2100	1,00	1,00	0,85	0,50	0,24	0,17	0,82	0,33	0,19	0,16	0,86	0,54	0,33	0,31
18	300	1,00	0,99	0,69	0,32	0,13	0,08	0,48	0,22	0,15	0,12	0,55	0,31	0,24	0,23
	900	1,00	1,00	0,74	0,39	0,18	0,12	0,55	0,25	0,16	0,13	0,59	0,33	0,25	0,24
	2100	1,00	1,00	0,80	0,48	0,25	0,17	0,61	0,29	0,18	0,15	0,65	0,35	0,27	0,25
19	300	1,00	0,90	0,41	0,15	0,07	0,06	0,22	0,11	0,09	0,06	0,46	0,23	0,17	0,15
	900	1,00	0,92	0,48	0,17	0,08	0,06	0,30	0,12	0,09	0,06	0,50	0,24	0,17	0,15
	2100	1,00	0,98	0,55	0,20	0,09	0,07	0,36	0,13	0,09	0,06	0,55	0,25	0,18	0,15
20	300	1,00	0,87	0,46	0,19	0,09	0,06	0,37	0,15	0,08	0,06	0,74	0,58	0,53	0,52
	900	1,00	0,87	0,56	0,21	0,09	0,06	0,42	0,16	0,08	0,06	0,77	0,59	0,53	0,52
	2100	1,00	0,97	0,71	0,25	0,10	0,06	0,51	0,18	0,09	0,07	0,80	0,61	0,53	0,52
21	300	1,00	1,00	0,97	0,83	0,59	0,48	0,83	0,78	0,57	0,49	0,87	0,84	0,62	0,52
	900	1,00	1,00	0,97	0,83	0,59	0,48	0,83	0,78	0,57	0,49	0,87	0,84	0,62	0,52
	2100	1,00	1,00	0,97	0,83	0,59	0,48	0,83	0,78	0,57	0,49	0,87	0,84	0,62	0,52
22	300	0,87	0,65	0,24	0,07	0,03	0,02	0,10	0,04	0,02	0,02	0,39	0,23	0,19	0,18
	900	0,87	0,68	0,27	0,08	0,03	0,02	0,11	0,04	0,02	0,02	0,42	0,23	0,19	0,18
	2100	0,88	0,74	0,30	0,08	0,03	0,02	0,12	0,04	0,02	0,02	0,45	0,23	0,19	0,18

Tungsten (W)

i	E_n	Δu	σ_f	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_э(e)$
1	6,5—10,5 Мэв	0,48	4,90	0,015	2,55	2,33	0,83	0,0018	0,021
2	4,0—6,5 Мэв	0,48	5,80	0,02	2,60	3,18	0,78	0,0024	0,026
3	2,5—4,0 Мэв	0,48	6,80	0,04	2,65	4,11	0,70	0,0032	0,032
4	1,4—2,5 Мэв	0,57	7,00	0,06	2,60	4,34	0,60	0,0043	0,033
5	0,8—1,4 Мэв	0,57	7,00	0,09	2,25	4,66	0,44	0,0060	0,049
6	0,4—0,8 Мэв	0,69	7,10	0,09	1,35	5,66	0,27	0,0079	0,065
7	0,2—0,4 Мэв	0,69	8,00	0,11	0,45	7,44	0,16	0,0091	0,098
8	0,1—0,2 Мэв	0,69	8,40	0,15	0,05	8,20	0,08	0,0099	0,118
9	46,5—100 кэв	0,77	9,00	0,22	—	8,78	0,04	0,0104	0,119
10	21,5—46,5 кэв	0,77	9,80	0,33	—	9,47	0,02	0,0106	0,130
11	10,0—21,5 кэв	0,77	12,0	0,50	—	11,5	0,01	0,0107	0,160
12	4,65—10,0 кэв	0,77	17,0	0,80	—	16,2	0,00	0,0108	0,227
13	2,15—4,65 кэв	0,77	24,0	1,4	—	22,6	0,00	0,0108	0,317
14	1,0—2,15 кэв	0,77	35,0	2,6	—	32,4	0,00	0,0108	0,455
15	465—1000 эв	0,77	49,0	5,0	—	44	0,00	0,0108	0,617
16	215—465 эв	0,77	295	9,0	—	286	0,00	0,0108	4,01
17	100—215 эв	0,77	114	23	—	91	0,00	0,0108	1,28
18	46,5—100 эв	0,77	23,0	9,0	—	14	0,00	0,0108	0,196
19	21,5—46,5 эв	0,77	148	85	—	63	0,00	0,0108	0,884
20	10,0—21,5 эв	0,77	1190	200	—	990	0,00	0,0108	13,9
21	4,65—10 эв	0,77	33,6	23	—	10,6	0,00	0,0108	0,149
22	2,15—4,65 эв	0,77	132	123	—	8,8	0,00	0,0108	0,123
23	1,0—2,15 эв	0,77	8,20	3,2	—	5	0,00	0,0108	0,070
24	0,465—1,0 эв	0,77	9,00	4,0	—	5	0,00	0,0108	0,070
25	0,215—0,465 эв	0,77	10,6	5,6	—	5	0,00	0,0108	0,070
T	0,0252 эв	—	24,2	19,2	—	5	0,00	—	—

i	$\sigma_{in}(i, i+k)$ при k, равном									
	0	1	2	3	4	5	6	7	8	9
1	0,00	0,02	0,10	0,51	0,74	0,72	0,32	0,10	0,03	0,01
2	0,01	0,09	0,54	0,72	0,75	0,34	0,11	0,03	0,01	—
3	0,09	0,16	0,65	0,88	0,55	0,20	0,08	0,03	0,01	—
4	0,58	0,84	0,55	0,42	0,16	0,04	0,01	—	—	—
5	1,15	0,75	0,20	0,11	0,04	—	—	—	—	—
6	0,88	0,44	0,02	0,01	—	—	—	—	—	—
7	0,15	0,27	0,03	—	—	—	—	—	—	—
8	0,00	0,03	0,02	—	—	—	—	—	—	—

i	T °K	I_c при σ_0, равной						I_l при σ_0, равной				I_g при σ_0, равной			
		∞	10^4	10^3	10^2	10	0	10^3	10^2	10	0	10^3	10^2	10	0
12	300	1,00	1,00	1,00	0,99	0,98	0,96	1,00	1,00	0,98	0,97	1,00	1,00	0,99	0,98
	900	1,00	1,00	1,00	1,00	0,98	0,97	1,00	1,00	0,98	0,98	1,00	1,00	1,00	0,98
	2100	1,00	1,00	1,00	1,00	0,99	0,98	1,00	1,00	0,99	0,98	1,00	1,00	1,00	0,99
13	300	1,00	1,00	0,97	0,91	0,88	0,85	0,99	0,97	0,91	0,87	1,00	0,98	0,95	0,94
	900	1,00	1,00	0,99	0,94	0,90	0,87	1,00	0,98	0,93	0,89	1,00	0,19	0,96	0,95
	2100	1,00	1,00	1,00	0,97	0,93	0,90	1,00	0,98	0,94	0,91	1,00	0,99	0,97	0,96
14	300	1,00	0,98	0,89	0,75	0,68	0,60	0,97	0,87	0,75	0,69	0,98	0,92	0,85	0,81
	900	1,00	0,99	0,92	0,81	0,73	0,63	0,98	0,89	0,78	0,72	0,98	0,95	0,87	0,83
	2100	1,00	1,00	0,94	0,88	0,78	0,67	0,98	0,90	0,81	0,75	1,00	0,98	0,90	0,85
15	300	1,00	0,95	0,76	0,52	0,40	0,32	0,89	0,68	0,50	0,40	0,95	0,81	0,68	0,58
	900	1,00	0,97	0,82	0,63	0,45	0,35	0,91	0,74	0,58	0,45	0,97	0,85	0,70	0,62
	2100	1,00	1,00	0,87	0,74	0,51	0,38	0,92	0,80	0,65	0,50	0,98	0,88	0,72	0,65
16	300	1,00	0,93	0,65	0,35	0,24	0,17	0,60	0,30	0,20	0,15	0,70	0,37	0,26	0,20
	900	1,00	0,95	0,72	0,45	0,28	0,19	0,70	0,37	0,23	0,17	0,76	0,48	0,29	0,21
	2100	1,00	0,98	0,80	0,56	0,31	0,20	0,80	0,45	0,27	0,19	0,83	0,58	0,33	0,22
17	300	1,00	0,90	0,56	0,25	0,15	0,10	0,37	0,17	0,11	0,10	0,55	0,26	0,18	0,14
	900	1,00	0,90	0,58	0,26	0,16	0,11	0,38	0,18	0,11	0,10	0,56	0,27	0,18	0,14
	2100	1,00	0,91	0,59	0,28	0,17	0,11	0,39	0,19	0,12	0,10	0,57	0,28	0,18	0,14
18	300	1,00	0,98	0,80	0,36	0,17	0,14	0,71	0,47	0,20	0,18	0,86	0,65	0,55	0,53
	900	1,00	0,99	0,84	0,38	0,18	0,15	0,76	0,48	0,20	0,19	0,88	0,67	0,56	0,54
	2100	1,00	1,00	0,88	0,43	0,20	0,17	0,81	0,49	0,21	0,19	0,90	0,68	0,57	0,55
19	300	1,00	0,98	0,71	0,32	0,19	0,17	0,52	0,22	0,13	0,10	0,73	0,37	0,25	0,23
	900	1,00	0,98	0,75	0,35	0,20	0,18	0,58	0,24	0,14	0,11	0,77	0,39	0,26	0,23
	2100	1,00	0,99	0,83	0,38	0,22	0,19	0,65	0,26	0,15	0,12	0,84	0,42	0,27	0,24
20	300	1,00	0,73	0,31	0,096	0,042	0,039	0,14	0,033	0,018	0,016	0,29	0,092	0,044	0,035
	900	1,00	0,74	0,32	0,098	0,043	0,039	0,15	0,036	0,022	0,016	0,30	0,093	0,044	0,035
	2100	1,00	0,74	0,34	0,102	0,044	0,039	0,17	0,041	0,029	0,016	0,31	0,097	0,045	0,035
21	300	1,00	0,97	0,84	0,41	0,19	0,15	0,81	0,49	0,39	0,38	1,00	1,00	1,00	1,0
	900	1,00	0,98	0,89	0,46	0,21	0,15	0,86	0,55	0,40	0,38	1,00	1,00	1,00	1,0
	2100	1,00	0,99	0,93	0,53	0,23	0,16	0,92	0,58	0,42	0,39	1,00	1,00	1,00	1,0
22	300	1,00	0,98	0,65	0,21	0,085	0,060	0,42	0,13	0,10	0,08	0,87	0,70	0,65	0,64
	900	1,00	0,98	0,75	0,22	0,087	0,062	0,51	0,13	0,10	0,08	0,91	0,71	0,65	0,64
	2100	1,00	0,99	0,83	0,25	0,090	0,063	0,59	0,13	0,10	0,08	0,94	0,72	0,65	0,64

Rhenium (Re)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{s(e)}$
1	6,5—10,5 *Мэв*	0,48	5,00	0,007	2,55	2,44	0,83	0,0018	0,023
2	4,0—6,5 *Мэв*	0,48	6,00	0,010	2,60	3,39	0,78	0,0024	0,027
3	2,5—4,0 *Мэв*	0,48	6,50	0,015	2,65	3,84	0,70	0,0032	0,030
4	1,4—2,5 *Мэв*	0,57	7,00	0,030	2,60	4,37	0,60	0,0043	0,033
5	0,8—1,4 *Мэв*	0,57	7,00	0,050	2,25	4,70	0,44	0,0060	0,049
6	0,4—0,8 *Мэв*	0,69	7,50	0,090	1,35	6,06	0,27	0,0078	0,068
7	0,2—0,4 *Мэв*	0,69	8,00	0,180	0,45	7,37	0,16	0,0090	0,096
8	0,1—0,2 *Мэв*	0,69	9,00	0,35	0,05	8,60	0,08	0,0098	0,122
9	46,5—100 *кэв*	0,77	10,0	0,70	—	9,30	0,04	0,0103	0,124
10	21,5—46,5 *кэв*	0,77	12,0	1,40	—	10,6	0,02	0,0105	0,144
11	10,0—21,5 *кэв*	0,77	15,0	2,50	—	12,5	0,01	0,0106	0,172
12	4,65—10,0 *кэв*	0,77	25,0	4,00	—	21,0	0,00	0,0107	0,292
13	2,15—4,65 *кэв*	0,77	40,0	7,00	—	33,0	0,00	0,0107	0,459
14	1,0—2,15 *кэв*	0,77	50,0	12,0	—	38,0	0,00	0,0107	0,528
15	465—1000 *эв*	0,77	60,0	22,0	—	38,0	0,00	0,0107	0,528
16	215—465 *эв*	0,77	90,0	50,0	—	40,0	0,00	0,0107	0,556
17	100—215 *эв*	0,77	100	55,0	—	45,0	0,00	0,0107	0,625
18	46,5—100 *эв*	0,77	85,0	47,0	—	38,0	0,00	0,0107	0,528
19	21,5—46,5 *эв*	0,77	71,0	50,0	—	21,0	0,00	0,0107	0,292
20	10,0—21,5 *эв*	0,77	74,0	58,0	—	16,0	0,00	0,0107	0,222
21	4,65—10,0 *эв*	0,77	95,0	79,0	—	16,0	0,00	0,0107	0,222
22	2,15—4,65 *эв*	0,77	680	600	—	80,0	0,00	0,0107	1,11
23	1,0—2,15 *эв*	0,77	785	700	—	85,0	0,00	0,0107	1,18
24	0,465—1,0 *эв*	0,77	40,0	25,0	—	15,0	0,00	0,0107	0,208
25	0,215—0,465 *эв*	0,77	43,0	28,0	—	15,0	0,00	0,0107	0,208
T	0,0252 *эв*	—	100	86,0	—	14,0	0,00	—	—

i	$\sigma_{in\,(i,\,i+k)}$ при k, равном								
	0	1	2	3	4	5	6	7	8
1	0,00	0,02	0,10	0,51	0,74	0,72	0,33	0,10	0,03
2	0,01	0,09	0,54	0,72	0,75	0,34	0,11	0,04	—
3	0,07	0,20	0,62	0,90	0,55	0,22	0,07	0,02	—
4	0,30	0,38	0,84	0,67	0,29	0,09	0,03	—	—
5	0,70	1,10	0,34	0,08	0,03	—	—	—	—
6	0,63	0,57	0,12	0,03	—	—	—	—	—
7	0,12	0,25	0,08	—	—	—	—	—	—
8	0,00	0,02	0,03	—	—	—	—	—	—

l	T °K	f_c при σ_0, равной				f_l при σ_0, равной				f_r при σ_0, равной			
		∞	10^4	10^3	10^2	∞	10^4	10^3	10^2	∞	10^4	10^3	10^2
12	300	1,00	1,00	0,98	0,93	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
	900	1,00	1,00	1,00	0,97	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
	2100	1,00	1,00	1,00	0,99	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
13	300	1,00	1,00	0,96	0,80	1,00	1,00	0,99	0,97	1,00	1,00	0,99	0,98
	900	1,00	1,00	0,98	0,90	1,00	1,00	1,00	0,98	1,00	1,00	1,00	0,99
	2100	1,00	1,00	1,00	0,97	1,00	1,00	1,00	0,98	1,00	1,00	1,00	0,99
14	300	1,00	1,00	0,88	0,65	1,00	0,99	0,97	0,87	1,00	1,00	0,98	0,92
	900	1,00	1,00	0,90	0,67	1,00	1,00	0,98	0,89	1,00	1,00	0,99	0,95
	2100	1,00	1,00	0,92	0,70	1,00	1,00	0,98	0,90	1,00	1,00	1,00	0,98
15	300	1,00	1,00	0,80	0,50	1,00	0,96	0,89	0,68	1,00	1,00	0,95	0,81
	900	1,00	1,00	0,85	0,60	1,00	0,98	0,91	0,74	1,00	1,00	0,97	0,85
	2100	1,00	1,00	0,90	0,67	1,00	1,00	0,92	0,80	1,00	1,00	0,98	0,88
16	300	1,00	1,00	0,75	0,40	1,00	0,95	0,77	0,66	1,00	1,00	0,85	0,75
	900	1,00	1,00	0,80	0,50	1,00	0,97	0,83	0,70	1,00	1,00	0,87	0,79
	2100	1,00	1,00	0,87	0,60	1,00	0,99	0,88	0,75	1,00	1,00	0,90	0,83
17	300	1,00	0,98	0,67	0,32	1,00	0,92	0,65	0,50	1,00	0,98	0,75	0,65
	900	1,00	1,00	0,78	0,41	1,00	0,95	0,72	0,60	1,00	1,00	0,81	0,70
	2100	1,00	1,00	0,85	0,50	1,00	0,98	0,79	0,70	1,00	1,00	0,86	0,75
18	300	1,00	0,95	0,63	0,32	1,00	0,89	0,56	0,32	1,00	0,96	0,73	0,55
	900	1,00	0,97	0,69	0,39	1,00	0,92	0,66	0,35	1,00	0,97	0,78	0,59
	2100	1,00	0,98	0,75	0,48	1,00	0,94	0,72	0,40	1,00	0,97	0,81	0,63
19	300	1,00	0,93	0,55	0,27	1,00	0,86	0,49	0,32	1,00	0,97	0,84	0,74
	900	1,00	0,95	0,62	0,31	1,00	0,89	0,59	0,34	1,00	0,98	0,87	0,76
	2100	1,00	0,97	0,67	0,36	1,00	0,91	0,66	0,36	1,00	0,99	0,89	0,77
20	300	1,00	0,97	0,69	0,42	1,00	0,94	0,63	0,39	1,00	0,99	0,95	0,90
	900	1,00	0,98	0,75	0,49	1,00	0,95	0,74	0,45	1,00	1,00	0,96	0,91
	2100	1,00	0,99	0,79	0,59	1,00	0,96	0,80	0,54	1,00	1,00	0,96	0,93
21	300	1,00	0,92	0,56	0,27	1,00	0,86	0,48	0,29	1,00	0,99	0,93	0,89
	900	1,00	0,95	0,62	0,31	1,00	0,90	0,55	0,30	1,00	0,99	0,94	0,90
	2100	1,00	0,97	0,68	0,36	1,00	0,91	0,65	0,32	1,00	0,99	0,95	0,90
22	300	1,00	0,65	0,25	0,18	1,00	0,46	0,16	0,06	1,00	0,68	0,34	0,28
	900	1,00	0,66	0,26	0,19	1,00	0,47	0,17	0,06	1,00	0,69	0,35	0,28
	2100	1,00	0,73	0,29	0,20	1,00	0,55	0,18	0,06	1,00	0,75	0,37	0,29
23	300	1,00	0,62	0,21	0,12	1,00	0,43	0,13	0,05	1,00	0,68	0,33	0,25
	900	1,00	0,63	0,22	0,12	1,00	0,43	0,13	0,05	1,00	0,69	0,33	0,26
	2100	1,00	0,70	0,24	0,12	1,00	0,51	0,13	0,05	1,00	0,74	0,36	0,26

Lead (Pb)

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{з(e)}$
1	6,5—10,5 *Мэв*	0,48	5,50	0,000	2,50	3,00	0,84	0,0015	0,023
2	4,0—6,5 *Мэв*	0,48	7,20	0,000	2,10	5,10	0,76	0,0023	0,040
3	2,5—4,0 *Мэв*	0,48	7,50	0,001	1,23	6,27	0,52	0,0046	0,071
4	1,4—2,5 *Мэв*	0,57	5,90	0,001	0,55	5,35	0,31	0,0066	0,062
5	0,8—1,4 *Мэв*	0,57	5,70	0,003	0,29	5,41	0,20	0,0077	0,073
6	0,4—0,8 *Мэв*	0,69	5,70	0,004	0,01	5,69	0,13	0,0084	0,069
7	0,2—0,4 *Мэв*	0,69	7,40	0,006	—	7,39	0,14	0,0083	0,089
8	0,1—0,2 *Мэв*	0,69	9,80	0,006	—	9,79	0,10	0,0086	0,122
9	46,5—100 *кэв*	0,77	10,7	0,005	—	10,7	0,05	0,0091	0,126
10	21,5—46,5 *кэв*	0,77	10,2	0,004	—	10,2	0,02	0,0094	0,125
11	10,0—21,5 *кэв*	0,77	10,7	0,002	—	10,7	0,01	0,0095	0,132
12	4,65—10,0 *кэв*	0,77	11,0	0,001	—	11,0	0,00	0,0096	0,137
13	2,15—4,65 *кэв*	0,77	11,0	0,001	—	11,0	0,00	0,0096	0,137
14	1,0—2,15 *кэв*	0,77	11,0	0,001	—	11,0	0,00	0,0096	0,137
15	465—1000 *эв*	0,77	11,1	0,001	—	11,1	0,00	0,0096	0,138
16	215—465 *эв*	0,77	11,2	0,002	—	11,2	0,00	0,0096	0,140
17	100—215 *эв*	0,77	11,3	0,002	—	11,3	0,00	0,0096	0,141
18	46,5—100 *эв*	0,77	11,3	0,003	—	11,3	0,00	0,0096	0,141
19	21,5—46,5 *эв*	0,77	11,3	0,005	—	11,3	0,00	0,0096	0,141
20	10,0—21,5 *эв*	0,77	11,3	0,007	—	11,3	0,00	0,0096	0,141
21	4,65—10 *эв*	0,77	11,3	0,010	—	11,3	0,00	0,0096	0,141
22	2,15—4,65 *эв*	0,77	11,3	0,015	—	11,3	0,00	0,0096	0,141
23	1,0—2,15 *эв*	0,77	11,3	0,022	—	11,3	0,00	0,0096	0,141
24	0,465—1,0 *эв*	0,77	11,3	0,033	—	11,3	0,00	0,0096	0,141
25	0,215—0465 *эв*	0,77	11,3	0,048	—	11,3	0,00	0,0096	0,141
T	0,0252 *эв*	—	11,5	0,170	—	11,3	0,00	0,0096	0,141

i	$\sigma_{in\,(i,\,i+k)}$ при k, равном								
	0	1	2	3	4	5	6	7	8
1	0,01	0,09	0,35	0,83	0,78	0,55	0,20	0,07	0,02
2	0,06	0,26	0,61	0,55	0,40	0,15	0,05	0,02	—
3	0,21	0,35	0,27	0,24	0,11	0,04	0,01	—	—
4	0,15	0,26	0,10	0,04	—	—	—	—	—
5	0,00	0,13	0,11	0,04	0,01	—	—	—	—
6	0,00	0,00	0,00	0,01	—	—	—	—	—

i	f_c при σ_0, равной				f_t при σ_0, равной				f_e при σ_0, равной			
	∞	10^2	10	0	∞	10^2	10	0	∞	10^2	10	0
3	1,00	1,00	1,00	1,00	1,00	1,00	0,99	0,96	1,00	1,00	1,00	0,99
4	1,00	1,00	1,00	1,00	1,00	1,00	0,97	0,92	1,00	1,00	0,99	0,98
5	1,00	1,00	1,00	1,00	1,00	0,99	0,95	0,89	1,00	1,00	0,98	0,94
6	1,00	1,00	1,00	1,00	1,00	0,99	0,96	0,91	1,00	1,00	0,98	0,94
7	1,00	1,00	1,00	1,00	1,00	1,00	0,98	0,96	1,00	1,00	0,99	0,97

Bismuth **(Bi)**

i	E_n	Δu	σ_i	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{з(e)}$
1	6,5—10,5 *Мэв*	0,48	5,30	0,001	2,50	2,80	0,82	0,0017	0,024
2	4,0—6,5 *Мэв*	0,48	7,20	0,001	2,15	5,05	0,72	0,0027	0,046
3	2,5—4,0 *Мэв*	0,48	7,40	0,0015	1,25	6,15	0,50	0,0048	0,073
4	1,4—2,5 *Мэв*	0,57	6,00	0,002	0,53	5,47	0,31	0,0066	0,063
5	0,8—1,4 *Мэв*	0,57	5,00	0,0025	0,10	4,90	0,21	0,0075	0,064
6	0,4—0,8 *Мэв*	0,69	6,00	0,0025	0,00	6,00	0,14	0,0082	0,071
7	0,2—0,4 *Мэв*	0,69	7,50	0,0025	—	7,50	0,10	0,0086	0,093
8	0,1—0,2 *Мэв*	0,69	9,00	0,0025	—	9,00	0,07	0,0088	0,115
9	46,5—100 *Мэв*	0,77	10,0	0,002	—	10,0	0,05	0,0090	0,117
10	21,5—46,5 *кэв*	0,77	11,5	0,002	—	11,5	0,02	0,0093	0,139
11	10,0—21,5 *кэв*	0,77	16,0	0,002	—	16,0	0,00	0,0095	0,197
12	4,65—10,0 *кэв*	0,77	9,5	0,005	—	9,5	0,00	0,0095	0,117
13	2,15—4,65 *кэв*	0,77	17,5	0,023	—	17,5	0,00	0,0095	0,216
14	1,0—2,15 *кэв*	0,77	9,5	0,0015	—	9,5	0,00	0,0095	0,117
15	465—1000 *эв*	0,77	220	0,190	—	220	0,00	0,0095	2,71
16	215—465 *эв*	0,77	8,80	0,0007	—	8,80	0,00	0,0095	0,109
17	100—215 *эв*	0,77	9,00	0,0006	—	9,00	0,00	0,0095	0,111
18	46,5—100 *эв*	0,77	9,00	0,0007	—	9,00	0,00	0,0095	0,111
19	21,5—46,5 *эв*	0,77	9,00	0,0010	—	9,00	0,00	0,0095	0,111
20	10,0—21,5 *эв*	0,77	9,00	0,0014	—	9,00	0,00	0,0095	0,111
21	4,65—10,0 *эв*	0,77	9,00	0,0021	—	9,00	0,00	0,0095	0,111
22	2,15—4,65 *эв*	0,77	9,00	0,0030	—	9,00	0,00	0,0095	0,111
23	1,0—2,15 *эв*	0,77	9,00	0,0044	—	9,00	0,00	0,0095	0,111
24	0,465—1,0 *эв*	0,77	9,01	0,0065	—	9,00	0,00	0,0095	0,111
25	0,215—0,465 *эв*	0,77	9,01	0,0095	—	9,00	0,00	0,0095	0,111
T	0,0252 *эв*	—	9,03	0,034	—	9,00	0,00	—	—

i	$\sigma_{in\,(i,\,i+k)}$ при k, равном								
	0	1	2	3	4	5	6	7	8
1	0,00	0,05	0,25	0,75	0,84	0,66	0,26	0,10	0,03
2	0,04	0,24	0,60	0,60	0,43	0,18	0,05	0,01	—
3	0,10	0,74	0,18	0,14	0,06	0,02	0,01	—	—
4	0,08	0,24	0,17	0,03	0,01	—	—	—	—
5	0,00	0,06	0,03	0,01	—	—	—	—	—

i	f_c при σ_0, равной					f_i при σ_0, равной				f_e при σ_0, равной			
	∞	10^4	10^3	10	0	10^4	10^2	10	0	10^4	10^2	10	0
5	1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,98	0,92	1,00	1,00	0,99	0,97
6	1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,97	0,85	1,00	1,00	0,99	0,94
7	1,00	1,00	1,00	1,00	1,00	1,00	0,99	0,94	0,78	1,00	1,00	0,98	0,89
8	1,00	1,00	1,00	1,00	1,00	1,00	0,96	0,89	0,70	1,00	1,0	0,93	0,81
9	1,00	1,00	1,00	1,00	1,00	0,99	0,89	0,81	0,62	1,00	0,99	0,86	0,74
10	1,00	1,00	1,00	1,00	1,00	0,95	0,81	0,71	0,56	0,99	0,95	0,79	0,67
11	1,00	1,00	1,00	1,00	1,00	0,87	0,71	0,61	0,48	0,98	0,90	0,71	0,61
12	1,00	0,95	0,78	0,65	0,62	0,97	0,92	0,89	0,87	0,99	0,95	0,91	0,90
13	1,00	0,80	0,42	0,21	0,18	0,83	0,61	0,49	0,44	0,90	0,70	0,56	0,51
14	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
15	1,00	0,62	0,26	0,13	0,10	0,58	0,38	0,29	0,24	0,71	0,47	0,35	,30

Thorium (Th^{232})

i	E_n	Δu	σ_t	σ_f	ν	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_s(e)$
1	6,5—10,5 *Мэв*	0,48	6,30	0,32	3,03	0,01	2,47	3,50	0,84	0,0014	0,025
2	4,0—6,5 *Мэв*	0,48	7,50	0,15	2,64	0,02	2,93	4,40	0,80	0,0017	0,025
3	2,5—4,0 *Мэв*	0,48	7,70	0,13	2,43	0,04	3,03	4,50	0,71	0,0025	0,028
4	1,4—2,5 *Мэв*	0,57	6,70	0,08	2,21	0,08	2,64	3,90	0,53	0,0040	0,028
5	0,8—1,4 *Мэв*	0,57	6,90	0,00	—	0,14	2,16	4,60	0,42	0,0050	0,040
6	0,4—0,8 *Мэв*	0,69	7,60	—	—	0,17	1,60	5,83	0,33	0,0058	0,049
7	0,2—0,4 *Мэв*	0,69	9,70	—	—	0,19	1,00	8,51	0,21	0,0068	0,084
8	0,1—0,2 *Мэв*	0,69	11,5	—	—	0,27	0,50	10,7	0,12	0,0076	0,118
9	46,5—100 *кэв*	0,77	12,7	—	—	0,42	0,17	12,1	0,07	0,0080	0,126
10	21,5—46,5 *кэв*	0,77	13,6	—	—	0,56	—	13,0	0,04	0,0083	0,140
11	10,0—21,5 *кэв*	0,77	14 5	—	—	0,75	—	13,7	0,02	0,0084	0,149
12	4,65—10,0 *кэв*	0,77	15,0	—	—	1,35	—	13,6	0,01	0,0085	0,150
13	2,15—4,65 *кэв*	0,77	16,0	—	—	2,10	—	13,9	0,00	0,0086	0,155
14	1,0—2,15 *кэв*	0,77	18,0	—	—	3,30	—	14,7	0,00	0,0086	0,164
15	465—1000 *эв*	0,77	23,0	—	—	5,00	—	18,0	0,00	0,0086	0,201
16	215—465 *эв*	0,77	33,0	—	—	11,0	—	22,0	0,00	0,0086	0,246
17	100—215 *эв*	0,77	41,0	—	—	19,0	—	22,0	0,00	0,0086	0,246
18	46,5—100 *эв*	0,77	60,0	—	—	28,0	—	32,0	0,00	0,0086	0,357
19	21,5—46 5 *эв*	0,77	64,0	—	—	47,0	—	17,0	0,00	0,0086	0,190
20	10,0—21,5 *эв*	0,77	23,5	—	—	12,0	—	11,5	0,00	0,0086	0,128
21	4,65—10,0 *эв*	0,77	12 5	—	—	0,46	—	12,0	0,00	0,0086	0,134
22	2,15—4,65 *эв*	0,77	12,7	—	—	0,67	—	12,0	0,00	0,0086	0,134
23	1,0—2,15 *эв*	0,77	13,0	—	—	0,99	—	12,0	0,00	0,0086	0,134
24	0,465—1,0 *эв*	0,77	13,5	—	—	1,45	—	12,0	0,00	0,0086	0,134
25	0,215—0,465 *эв*	0,77	14,1	—	—	2,11	—	12,0	0,00	0,0086	0,134
T	0,0252 *эв*	—	19,6	—	—	7,56	—	12,0	0,00	—	—

i	$\sigma_{in}(i, i+k)$ при k, равном									
	0	1	2	3	4	5	6	7	8	9
1	0,00	0,02	0,14	0,57	0,91	1,03	0,58	0,22	0,06	0,02
2	0,02	0,11	0,47	0,83	0,85	0,45	0,14	0,05	0,01	—
3	0,06	0,34	0,77	0,99	0,55	0,23	0,07	0,02	—	—
4	0,19	0,90	1,02	0,36	0,12	0,04	0,01	—	—	—
5	1,00	0,70	0,31	0,11	0,03	0,01	—	—	—	—
6	1,25	0,33	0,02	0,00	0,00	—	—	—	—	—
7	0,68	0,30	0,02	0,00	—	—	—	—	—	—
8	0,27	0,23	0,00	—	—	—	—	—	—	—
9	0,06	0,08	0,03	—	—	—	—	—	—	—

i	T °K	f_c при σ_0, равной						f_t при σ_0, равной				f_e при σ_0, равной			
		∞	10^4	10^3	10^2	10	0	10^3	10^2	10	0	10^3	10^2	10	0
9	300	1,00	1,00	1,00	1,00	0,99	0,98	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
	900	1,00	1,00	1,00	1,00	1,00	0,99	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
	2100	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
10	300	1,00	1,00	0,99	0,98	0,95	0,92	1,00	1,00	0,99	0,98	1,00	1,00	1,00	1,00
	900	1,00	1,00	1,00	1,00	0,98	0,95	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
	2100	1,00	1,00	1,00	1,00	1,00	0,99	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
11	300	1,00	1,00	0,98	0,97	0,86	0,78	1,00	0,98	0,94	0,92	1,00	0,99	0,97	0,96
	900	1,00	1,00	1,00	0,98	0,93	0,88	1,00	1,00	0,99	0,95	1,00	1,00	0,99	0,98
	2100	1,00	1,00	1,00	1,00	0,99	0,98	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
12	300	1,00	1,00	0,97	0,92	0,72	0,61	0,99	0,94	0,85	0,76	0,99	0,97	0,92	0,78
	900	1,00	1,00	1,00	0,95	0,82	0,73	1,00	0,98	0,89	0,78	1,00	0,99	0,95	0,82
	2100	1,00	1,00	1,00	0,99	0,94	0,87	1,00	1,00	0,95	0,82	1,00	1,00	0,98	0,86
13	300	1,00	1,00	0,95	0,80	0,54	0,43	0,97	0,86	0,73	0,65	0,99	0,93	0,84	0,70
	900	1,00	1,00	0,98	0,87	0,64	0,51	0,99	0,90	0,76	0,68	0,99	0,96	0,88	0,73
	2100	1,00	1,00	0,99	0,94	0,74	0,62	1,00	0,95	0,80	0,71	1,00	0,99	0,92	0,76
14	300	1,00	0,99	0,92	0,62	0,35	0,27	0,93	0,73	0,63	0,58	0,98	0,86	0,75	0,65
	900	1,00	1,00	0,97	0,72	0,42	0,35	0,97	0,78	0,64	0,60	0,99	0,89	0,78	0,67
	2100	1,00	1,00	0,99	0,82	0,53	0,44	1,00	0,83	0,65	0,62	1,00	0,94	0,82	0,70
15	300	1,00	0,97	0,87	0,45	0,19	0,14	0,86	0,59	0,51	0,46	0,94	0,78	0,66	0,60
	900	1,00	0,98	0,92	0,55	0,25	0,19	0,91	0,62	0,52	0,47	0,97	0,80	0,69	0,62
	2100	1,00	0,99	0,96	0,64	0,32	0,23	0,96	0,65	0,53	0,49	0,99	0,86	0,73	0,64
16	300	1,00	0,93	0,62	0,26	0,12	0,085	0,70	0,45	0,32	0,24	0,74	0,56	0,49	0,41
	900	1,00	0,95	0,72	0,33	0,16	0,11	0,78	0,48	0,33	0,25	0,77	0,57	0,49	0,42
	2100	1,00	0,97	0,81	0,40	0,19	0,14	0,90	0,55	0,34	0,26	0,82	0,63	0,50	0,43
17	300	1,00	0,89	0,45	0,17	0,079	0,059	0,58	0,31	0,28	0,22	0,70	0,55	0,50	0,45
	900	1,00	0,93	0,51	0,20	0,10	0,070	0,67	0,33	0,29	0,22	0,75	0,57	0,50	0,47
	2100	1,00	0,98	0,60	0,24	0,13	0,078	0,72	0,35	0,30	0,23	0,80	0,59	0,52	0,49
18	300	1,00	0,78	0,28	0,097	0,045	0,038	0,32	0,20	0,18	0,15	0,49	0,38	0,34	0,32
	900	1,00	0,84	0,30	0,11	0,050	0,043	0,35	0,21	0,18	0,16	0,49	0,38	0,35	0,33
	2100	1,00	0,88	0,33	0,12	0,056	0,046	0,37	0,21	0,18	0,16	0,50	0,39	0,35	0,34
19	300	1,00	0,83	0,30	0,11	0,051	0,038	0,45	0,25	0,23	0,20	0,79	0,68	0,65	0,62
	900	1,00	0,87	0,32	0,11	0,055	0,039	0,50	0,28	0,24	0,20	0,83	0,69	0,66	0,62
	2100	1,00	0,92	0,35	0,12	0,058	0,041	0,55	0,32	0,26	0,21	0,86	0,70	0,66	0,63
20	300	1,00	0,85	0,32	0,12	0,056	0,040	0,58	0,48	0,47	0,45	1,0	1,0	1,0	1,0
	900	1,00	0,92	0,38	0,14	0,062	0,042	0,62	0,51	0,47	0,46	1,0	1,0	1,0	1,0
	2100	1,00	0,94	0,42	0,16	0,067	0,044	0,66	0,54	0,48	0,46	1,0	1,0	1,0	1,0

Uranium (U^{238})

i	E_n	Δu	σ_t	σ_f	ν	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{з}(e)$
1	6,5—10,5 *Мэв*	0,48	6,30	2,10	3,37	0,01	0,69	3,50	0,85	0,0013	0,023
2	4,0—6,5 *Мэв*	0,48	7,40	1,60	3,02	0,02	1,48	4,30	0,80	0,0017	0,025
3	2,5—4,0 *Мэв*	0,48	7,70	1,85	2,78	0,03	1,32	4,50	0,71	0,0025	0,028
4	1,4—2,5 *Мэв*	0,57	7,00	1,93	2,63	0,04	1,13	3,90	0,55	0,0039	0,027
5	0,8—1,4 *Мэв*	0,57	6,60	1,93	2,58	0,07	0,90	3,70	0,45	0,0047	0,030
6	0,4—0,8 *Мэв*	0,69	7,40	2,05	2,51	0,12	0,66	4,57	0,35	0,0056	0,037
7	0,2—0,4 *Мэв*	0,69	9,20	2,30	2,51	0,20	0,40	6,30	0,23	0,0066	0,060
8	0,1—0,2 *Мэв*	0,69	10,6	2,40	2,50	0,26	0,29	7,65	0,13	0,0075	0,083
9	46,5—100 *кэв*	0,77	12,1	2,80	2,49	0,34	0,12	8,84	0,07	0,0080	0,092
10	21,5—46,5 *кэв*	0,77	13,2	3,50	2,49	0,60	—	9,10	0,04	0,0082	0,097
11	10,0—21,5 *кэв*	0,77	15,0	4,60	2,49	0,85	—	9,50	0,02	0,0084	0,104
12	4,65—10,0 *кэв*	0,77	17,3	6,60	2,49	1,40	—	9,30	0,01	0,0085	0,103
13	2,15—4,65 *кэв*	0,77	20,5	7,70	2,49	1,80	—	11,0	0,00	0,0086	0,123
14	1,0—2,15 *кэв*	0,77	23,0	8,80	2,49	2,20	—	12,0	0,00	0,0086	0,134
15	465—1000 *эв*	0,77	28,5	12	2,49	3,50	—	13,0	0,00	0,0086	0,145
16	215—465 *эв*	0,77	35,4	16	2,49	6,40	—	13,0	0,00	0,0086	0,145
17	100—215 *эв*	0,77	48	25	2,49	10,0	—	13,0	0,00	0,0086	0,145
18	46,5—100 *эв*	0,77	57	32	2,49	12,0	—	13,0	0,00	0,0086	0,145
19	21,5—46,5 *эв*	0,77	94	65	2,49	16,0	—	13,0	0,00	0,0086	0,145
20	10,0—21,5 *эв*	0,77	154	110	2,49	31	—	13,0	0,00	0,0086	0,145
21	4,65—10,0 *эв*	0,77	128	94	2,49	22	—	12,5	0,00	0,0086	0,140
22	2,15—4,65 *эв*	0,77	177	126	2,49	39	—	12,5	0,00	0,0086	0,140
23	1,0—2,15 *эв*	0,77	422	350	2,49	60	—	12,5	0,00	0,0086	0,140
24	0,465—1,0 *эв*	0,77	147	124	2,49	10,5	—	12,5	0,00	0,0086	0,140
25	0,215—0,465 *эв*	0,77	191	165	2,49	14	—	12,5	0,00	0,0086	0,140
T	0,0252 *эв*	—	590	525	2,49	53	—	12,5	0,00	—	—

i	$\sigma_{in}(i, i+k)$ при k, равном									
	0	1	2	3	4	5	6	7	8	9
1	0,00	0,00	0,04	0,16	0,28	0,34	0,20	0,08	0,03	0,01
2	0,01	0,06	0,23	0,42	0,41	0,22	0,09	0,03	0,01	—
3	0,05	0,16	0,32	0,41	0,24	0,10	0,03	0,01	—	—
4	0,08	0,19	0,42	0,27	0,12	0,04	0,01	—	—	—
5	0,20	0,33	0,22	0,10	0,04	0,01	—	—	—	—
6	0,29	0,25	0,08	0,03	0,01	—	—	—	—	—
7	0,23	0,12	0,03	0,02	—	—	—	—	—	—
8	0,17	0,12	—	—	—	—	—	—	—	—
9	0,06	0,04	0,02	—	—	—	—	—	—	—

i	T °K	f_l при σ_0, равной				f_c при σ_0, равной				f_t при σ_0, равной			f_e при σ_0, равной		
		10^3	10^2	10	0	10^3	10^2	10	0	10^2	10	0	10^2	10	0
11	300	1,00	1,00	0,99	0,97	1,00	1,00	0,99	0,96	1,00	1,00	0,99	1,00	1,00	1,00
	900	1,00	1,00	1,00	0,99	1,00	1,00	1,00	0,99	1,00	1,00	1,00	1,00	1,00	1,00
	2100	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
12	300	1,00	1,00	0,98	0,95	1,00	1,00	0,97	0,94	1,00	1,00	0,99	1,00	1,00	1,00
	900	1,00	1,00	0,99	0,97	1,00	1,00	0,99	0,96	1,00	1,00	0,99	1,00	1,00	1,00
	2100	1,00	1,00	1,00	0,99	1,00	1,00	1,00	0,99	1,00	1,00	1,00	1,00	1,00	1,00
13	300	1,00	1,00	0,96	0,92	1,00	0,99	0,94	0,90	1,00	0,98	0,96	1,00	1,00	1,00
	900	1,00	1,00	0,97	0,95	1,00	0,99	0,96	0,94	1,00	0,99	0,98	1,00	1,00	1,00
	2100	1,00	1,00	0,98	0,97	1,00	1,00	0,98	0,97	1,00	0,99	0,97	1,00	1,00	1,00
14	300	1,00	0,98	0,91	0,88	1,00	0,97	0,88	0,85	0,99	0,94	0,92	1,00	1,00	1,00
	900	1,00	0,99	0,95	0,92	1,00	0,98	0,93	0,90	1,00	0,96	0,94	1,00	1,00	1,00
	2100	1,00	1,00	0,98	0,96	1,00	0,99	0,97	0,95	1,00	0,98	0,96	1,00	1,00	1,00
15	300	0,99	0,95	0,87	0,84	0,99	0,93	0,83	0,78	0,95	0,86	0,84	1,00	1,00	1,00
	900	1,00	0,98	0,91	0,88	1,00	0,96	0,87	0,82	0,98	0,92	0,90	1,00	1,00	1,00
	2100	1,00	0,99	0,96	0,92	1,00	0,98	0,92	0,87	1,00	0,98	0,96	1,00	1,00	1,00
16	300	0,98	0,92	0,82	0,78	0,98	0,88	0,75	0,70	0,89	0,79	0,75	1,00	1,00	1,00
	900	1,00	0,95	0,85	0,81	1,00	0,91	0,78	0,74	0,95	0,85	0,82	1,00	1,00	1,00
	2100	1,00	0,98	0,88	0,84	1,00	0,94	0,81	0,78	0,99	0,91	0,89	1,00	1,00	1,00
17	300	0,96	0,87	0,76	0,71	0,96	0,84	0,69	0,63	0,82	0,70	0,65	1,00	1,00	1,00
	900	0,99	0,90	0,80	0,75	0,99	0,87	0,73	0,68	0,88	0,76	0,72	1,00	1,00	1,00
	2100	1,00	0,93	0,84	0,73	1,00	0,90	0,77	0,72	0,85	0,82	0,79	1,00	1,00	1,00
18	300	0,94	0,82	0,70	0,64	0,94	0,78	0,62	0,56	0,74	0,60	0,55	1,00	1,00	1,00
	900	0,97	0,86	0,73	0,67	0,97	0,82	0,66	0,61	0,78	0,65	0,60	1,00	1,00	1,00
	2100	0,99	0,91	0,76	0,70	0,99	0,87	0,69	0,64	0,83	0,70	0,65	1,00	1,00	1,00
19	300	0,92	0,76	0,63	0,57	0,91	0,73	0,56	0,49	0,65	0,50	0,43	1,00	1,00	1,00
	900	0,95	0,78	0,66	0,59	0,94	0,75	0,59	0,51	0,68	0,52	0,45	1,00	1,00	1,00
	2100	0,98	0,81	0,69	0,61	0,98	0,78	0,62	0,54	0,70	0,54	0,47	1,00	1,00	1,00
20	300	0,90	0,71	0,57	0,50	0,88	0,67	0,48	0,41	0,56	0,37	0,33	1,00	1,00	1,00
	900	0,91	0,73	0,59	0,51	0,89	0,69	0,50	0,42	0,58	0,39	0,34	1,00	1,00	1,00
	2100	0,93	0,75	0,61	0,52	0,91	0,71	0,52	0,43	0,61	0,42	0,36	1,00	1,00	1,00
21	300	0,91	0,79	0,68	0,65	0,90	0,74	0,65	0,64	0,70	0,59	0,56	1,00	1,00	1,00
	900	0,91	0,79	0,68	0,65	0,90	0,74	0,65	0,65	0,70	0,60	0,56	1,00	1,00	1,00
	2100	0,91	0,80	0,69	0,66	0,91	0,75	0,67	0,66	0,71	0,61	0,57	1,00	1,00	1,00
22	300	0,90	0,73	0,65	0,64	0,78	0,48	0,40	0,32	0,56	0,52	0,50	1,00	1,00	1,00
	900	0,90	0,73	0,65	0,64	0,78	0,48	0,40	0,32	0,56	0,52	0,50	1,00	1,00	1,00
	2100	0,90	0,73	0,65	0,64	0,78	0,48	0,40	0,32	0,56	0,52	0,50	1,00	1,00	1,00
23	300	0,92	0,78	0,76	0,76	0,89	0,73	0,67	0,66	0,66	0,62	0,61	1,00	1,00	1,00
	900	0,92	0,78	0,76	0,76	0,89	0,73	0,67	0,66	0,66	0,62	0,61	1,00	1,00	1,00
	2100	0,92	0,78	0,76	0,76	0,89	0,73	0,67	0,66	0,66	0,62	0,61	1,00	1,00	1,00

Uranium (U^{234})

i	E_n	Δu	σ_t	σ_f	ν	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_з(e)$
1	6,5—10,5 *Мэв*	0,48	6,30	2,00	3,37	0,00	0,80	3,50	0,84	0,0014	0,025
2	4,0—6,5 *Мэв*	0,48	7,50	1,55	3,01	0,02	1,53	4,40	0,80	0,0017	0,025
3	2,5—4,5 *Мэв*	0,48	7,70	1,52	2,77	0,04	1,64	4,50	0,71	0,0025	0,028
4	1,4—2,5 *Мэв*	0,57	6,80	1,43	2,62	0,08	1,29	4,00	0,53	0,0040	0,028
5	0,8—1,4 *Мэв*	0,57	7,00	1,22	2,51	0,25	1,17	4,36	0,42	0,0049	0,037
6	0,4—0,8 *Мэв*	0,69	7,60	0,70	2,44	0,25	1,20	5,45	0,33	0,0057	0,045
7	0,2—0,4 *Мэв*	0,69	9,70	0,12	2,41	0,30	0,97	8,31	0,21	0,0067	0,081
8	0,1—0,2 *Мэв*	0,69	11,5	0,04	2,39	0,45	0,52	10,5	0,12	0,0075	0,114
9	46,5—100 *кэв*	0,77	12,5	0,03	2,38	0,55	0,17	11,8	0,07	0,0079	0,121
10	21,5—46,5 *кэв*	0,77	13,5	0,02	2,37	0,75	0,00	12,7	0,04	0,0082	0,135
11	10,0—21,5 *кэв*	0,77	14,5	0,02	2,37	1,00	—	13,5	0,02	0,0083	0,145
12	4,65—10,0 *кэв*	0,77	15,5	0,02	2,37	1,40	—	14,1	0,01	0 0084	0,154
13	2,15—4,65 *кэв*	0,77	17,0	—	—	2,20	—	14,8	0,00	0,0085	0,163
14	1,0—2,15 *кэв*	0,77	20,0	—	—	3,50	—	16,5	0,00	0,0085	0,182
15	465—1000 *эв*	0,77	25,0	—	—	5,50	—	19,5	0,00	0,0085	0,215
16	215—465 *эв*	0,77	44,0	—	—	8,00	—	36,0	0,00	0,0085	0,397
17	100—215 *эв*	0,77	50,0	—	—	21,0	—	29,0	0,00	0,0085	0,320
18	46,5—100 *эв*	0,77	47,0	—	—	30,0	—	17,0	0,00	0,0085	0,188
19	21,5—46,5 *эв*	0,77	43,0	—	—	33,0	—	10,0	0,00	0,0085	0,110
20	10,0—21,5 *эв*	0,77	10,2	—	—	0,20	—	10,0	0,00	0,0085	0,110
21	4,65—10,0 *эв*	0,77	860	—	—	735	—	125	0,00	0,0085	1,38
22	2,15—4,65 *эв*	0,77	19,5	—	—	9,00	—	10,5	0,00	0,0085	0,116
23	1,0—2,15 *эв*	0,77	17,2	—	—	7,20	—	10,0	0,00	0,0085	0,110
24	0,465—1,0 *эв*	0,77	28,5	—	—	18,5	—	10,0	0,00	0,0085	0,110
25	0,215—0,465 *эв*	0,77	54,6	—	—	44,6	—	10,0	0,00	0,0085	0,110
T	0,0252 *эв*	—	115	—	—	105	—	10,0	0,00	—	—

i	$\sigma_{in}(i,\ i+k)$ при k, равном								
	0	1	2	3	4	5	6	7	8
1	0,00	0,00	0,04	0,19	0,28	0,29	0,15	0,06	0,02
2	0,01	0,06	0,24	0,43	0,45	0,23	0,08	0,02	0,01
3	0,04	0,18	0,42	0,54	0,29	0,12	0,04	0,01	—
4	0,09	0,38	0,49	0,22	0,08	0,03	—	—	—
5	0,58	0,33	0,17	0,07	0,02	—	—	—	—
6	0,94	0,25	0,01	—	—	—	—	—	—
7	0,67	0,28	0,02	—	—	—	—	—	—
8	0,29	0,23	—	—	—	—	—	—	—
9	0,06	0,08	0,03	—	—	—	—	—	—

l	T °K	f_c при σ_0, равной				f_t при σ_0, равной			f_e при σ_0, равной		
		10^4	10^6	10^8	10^9	10^4	10^6	10^8	10^4	10^6	10^8
11	300	1,00	1,00	0,98	0,97	1,00	1,00	0,98	1,00	1,00	0,99
	900	1,00	1,00	1,00	0,98	1,00	1,00	1,00	1,00	1,00	1,00
	2100	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
12	300	1,00	1,00	0,97	0,92	1,00	0,99	0,94	1,00	0,99	0,97
	900	1,00	1,00	1,00	0,95	1,00	1,00	0,98	1,00	1,00	0,99
	2100	1,00	1,00	1,00	0,99	1,00	1,00	1,00	1,00	1,00	1,00
13	300	1,00	1,00	0,95	0,80	1,00	0,97	0,86	1,00	0,99	0,93
	900	1,00	1,00	0,98	0,87	1,00	0,99	0,90	1,00	0,99	0,96
	2100	1,00	1,00	0,99	0,94	1,00	1,00	0,95	1,00	1,00	0,99
14	300	1,00	0,99	0,92	0,62	1,00	0,93	0,73	1,00	0,98	0,86
	900	1,00	0,00	0,97	0,72	1,00	0,97	0,78	1,00	0,99	0,89
	2100	1,00	1,00	0,99	0,82	1,00	1,00	0,83	1,00	1,00	0,94
15	300	1,00	0,97	0,87	0,45	1,00	0,86	0,59	1,00	0,94	0,78
	900	1,00	0,98	0,92	0,55	1,00	0,91	0,62	1,00	0,97	0,80
	2100	1,00	0,99	0,96	0,64	1,00	0,96	0,65	1,00	0,99	0,8
16	300	1,00	0,92	0,58	0,20	0,84	0,50	0,29	0,92	0,65	0,40
	900	1,00	0,95	0,67	0,25	0,87	0,58	0,30	0,95	0,71	0,44
	2100	1,00	0,96	0,74	0,31	0,91	0,66	0,32	0,96	0,77	0,48
17	300	1,00	0,91	0,59	0,21	0,82	0,44	0,23	0,90	0,61	0,36
	900	1,00	0,94	0,68	0,26	0,87	0,51	0,24	0,93	0,66	0,39
	2100	1,00	0,96	0,76	0,35	0,91	0,62	0,27	0,95	0,73	0,43
18	300	0,98	0,86	0,45	0,13	0,82	0,37	0,22	0,91	0,64	0,45
	900	0,99	0,91	0,54	0,17	0,87	0,43	0,23	0,94	0,70	0,50
	2100	0,99	0,94	0,62	0,21	0,94	0,50	0,24	0,96	0,71	0,50
19	300	0,96	0,72	0,27	0,083	0,61	0,29	0,22	0,86	0,64	0,54
	900	0,97	0,76	0,30	0,085	0,70	0,30	0,22	0,88	0,65	0,54
	2100	0,98	0,82	0,39	0,099	0,79	0,34	0,23	0,91	0,69	0,55
20	300	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
	900	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
	2100	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
21	300	0,91	0,55	0,16	0,058	0,37	0,081	0,043	0,58	0,22	0,13
	900	0,94	0,64	0,20	0,070	0,47	0.091	0,044	0,67	0,26	0,14
	2100	0,96	0,76	0,31	0,097	0,60	0.14	0,049	0,77	0,36	0,16

Uranium (U^{235})

i	E_n	Δu	σ_t	σ_f	ν	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{з(e)}$
1	6,5—10,5 *Мэв*	0,48	6,30	1,75	3,40	0,02	1,03	3,50	0,84	0,0013	0,023
2	4,0—6,5 *Мэв*	0,48	7.40	1,15	3,04	0 03	1,92	4,30	0,80	0,0017	0,025
3	2,5—4,0 *Мэв*	0,48	7,70	1.25	2.79	0,04	1.91	4,50	0,71	0,0024	0,027
4	1,4—2,5 *Мэв*	0,57	7,00	1,28	2 63	0,06	1,76	3,90	0,55	0,0038	0,026
5	0,8—1,4 *Мэв*	0,57	6,60	1,25	2,52	0,12	1,38	3,85	0,45	0,0046	0,031
6	0,4—0,8 *Мэв*	0,69	7,40	1,23	2,46	0.17	1,20	4,80	0,35	0,0054	0,038
7	0,2—0,4 *Мэв*	0,69	9,20	1,41	2,47	0,25	1,00	6,54	0,23	0,0064	0,061
8	0,1—0,2 *Мэв*	0,69	11,2	1,70	2,45	0,40	0,60	8,50	0,13	0,0073	0,090
9	46,5—100 *кэв*	0,77	12,5	2,10	2,44	0,60	0,18	9,62	0,07	0,0078	0,097
10	21,5—46,5 *кэв*	0,77	14,0	2,65	2,43	1,00	0,06	10,3	0,04	0,0081	0,108
11	10 0—21,5 *кэв*	0,77	16,0	3,40	2,42	1,50	—	11,1	0,02	0,0082	0,118
12	4,65—10,0 *кэв*	0,77	19,0	4.40	2.42	2.10	—	12 5	0,01	0,0083	0,135
13	2,15—4,65 *кэв*	0,77	23,0	5,40	2,42	2.75	—	14,8	0,00	0,0084	0,161
14	1,0—2 15 *кэв*	0,77	27,0	7,30	2,42	3,80	—	15,9	0,00	0,0084	0,174
15	465—1000 *эв*	0,77	32,0	11,0	2,42	6,3	—	14,7	0,00	0,0084	0,160
16	215—465 *эв*	0,77	38,0	16,0	2,42	9,5	—	12,5	0,00	0 0084	0,136
17	100—215 *эв*	0,77	47,7	22	2,42	13,5	—	12,2	0,00	0,0084	0,133
18	46,5—100 *эв*	0 77	69,0	35	2,42	22	—	12	0,00	0,0084	0,131
19	21,5—46,5 *эв*	0,77	88,0	45	2,42	31	—	12	0,00	0,0084	0,131
20	10,0—21,5 *эв*	0,77	111	45	2,42	54	—	12	0,00	0,0084	0,131
21	4,65—10,0 *эв*	0,77	93,0	37	2,42	44	—	12	0,00	0,0084	0,131
22	2,15—4,65 *эв*	0,77	39,0	20	2,42	7	—	12	0,00	0,0084	0,131
23	1,0—2,15 *эв*	0,77	61,0	35	2,42	13	—	13	0,00	0,0084	0,142
24	0,465—1,0 *эв*	0,77	88,0	64	2,42	10	—	14	0,00	0,0084	0,153
25	0,215—0,465 *эв*	0,77	205	155	2,42	35	—	15	0,00	0,0084	0,164
T	0,0252 *эв*	—	698	582	2,42	101	—	15	0,00	—	—

i	$\sigma_{in\,(i,\,i+k)}$ при k, равном									
	0	1	2	3	4	5	6	7	8	9
1	0,00	0,01	0,05	0,25	0,43	0,56	0,35	0,14	0,04	0,01
2	0,02	0,08	0,35	0,54	0,51	0,26	0,11	0,04	0,01	—
3	0,10	0,27	0,53	0,54	0,30	0,12	0,04	0,01	—	—
4	0,20	0,35	0,57	0,40	0,16	0,06	0,02	—	—	—
5	0,20	0,51	0,37	0,20	0,08	0,02	—	—	—	—
6	0,44	0,44	0,22	0,08	0,02	—	—	—	—	—
7	0,61	0,38	0,01	—	—	—	—	—	—	—
8	0,21	0,29	0,08	0,02	—	—	—	—	—	—
9	0,09	0,07	0,02	—	—	—	—	—	—	—
10	0,05	0,01	—	—	—	—	—	—	—	—

l	T °K	f_l при σ_0, равной				f_c при σ_0, равной				f_t при σ_0, равной			f_e при σ_0, равной		
		10^4	10^2	10	0	10^4	10^2	10	0	10^2	10	0	10^2	10	0
11	300	1,00	1,00	0,98	0,97	1,00	1,00	0,98	0,97	1,00	0,99	0,98	1,00	1,00	1,00
	900	1,00	1,00	1,00	0,99	1,00	1,00	1,00	0,99	1,00	1,00	1,00	1,00	1,00	1,00
	2100	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
12	300	1,00	0,99	0,96	0,94	1,00	0,99	0,96	0,94	1,00	0,98	0,96	1,00	1,00	0,99
	900	1,00	1,00	0,98	0,97	1,00	1,00	0,98	0,97	1,00	0,99	0,98	1,00	1,00	1,00
	2100	1,00	1,00	1,00	0,99	1,00	1,00	1,00	0,99	1,00	1,00	0,99	1,00	1,00	1,00
13	300	1,00	0,99	0,93	0,89	1,00	0,99	0,93	0,89	0,99	0,96	0,93	1,00	0,99	0,98
	900	1,00	1,00	0,97	0,94	1,00	1,00	0,97	0,94	1,00	0,99	0,97	1,00	1,00	0,99
	2100	1,00	1,00	0,99	0,98	1,00	1,00	0,99	0,98	1,00	1,00	0,99	1,00	1,00	1,00
14	300	1,00	0,97	0,88	0,82	1,00	0,97	0,88	0,82	0,96	0,92	0,88	1,00	0,98	0,96
	900	1,00	0,99	0,95	0,91	1,00	0,99	0,95	0,91	0,99	0,97	0,94	1,00	0,99	0,97
	2100	1,00	1,00	0,98	0,97	1,00	1,00	0,98	0,97	1,00	0,99	0,97	1,00	1,00	0,98
15	300	1,00	0,94	0,82	0,75	1,00	0,94	0,81	0,74	0,93	0,88	0,82	0,99	0,97	0,95
	900	1,00	0,97	0,92	0,86	1,00	0,97	0,92	0,85	0,97	0,95	0,93	1,00	0,99	0,97
	2100	1,00	0,99	0,97	0,93	1,00	0,99	0,97	0,93	0,99	0,98	0,97	1,00	1,00	0,99
16	300	0,99	0,90	0,75	0,67	0,99	0,89	0,74	0,65	0,85	0,78	0,73	1,00	1,00	1,00
	900	1,00	0,95	0,87	0,81	1,00	0,95	0,86	0,80	0,94	0,89	0,86	1,00	1,00	1,00
	2100	1,00	0,98	0,93	0,89	1,00	0,98	0,93	0,88	0,98	0,95	0,93	1,00	1,00	1,00
17	300	0,97	0,83	0,67	0,60	0,97	0,81	0,64	0,56	0,80	0,70	0,62	1,00	1,00	1,00
	900	0,99	0,90	0,81	0,75	0,99	0,89	0,79	0,72	0,87	0,83	0,77	1,00	1,00	1,00
	2100	1,00	0,97	0,93	0,88	1,00	0,97	0,92	0,86	0,94	0,91	0,90	1,00	1,00	1,00
18	300	0,95	0,77	0,61	0,55	0,94	0,74	0,56	0,48	0,70	0,56	0,50	1,00	1,00	1,00
	900	0,97	0,82	0,71	0,64	0,96	0,80	0,68	0,59	0,75	0,64	0,58	1,00	1,00	1,00
	2100	0,99	0,87	0,80	0,73	0,98	0,86	0,78	0,70	0,80	0,72	0,66	1,00	1,00	1,00
19	300	0,91	0,70	0,56	0,52	0,90	0,65	0,48	0,43	0,57	0,42	0,39	1,00	1,00	1,00
	900	0,93	0,73	0,60	0,56	0,92	0,67	0,52	0,47	0,59	0,45	0,42	1,00	1,00	1,00
	2100	0,95	0,76	0,64	0,60	0,94	0,70	0,56	0,51	0,61	0,48	0,45	1,00	1,00	1,00
20	300	0,88	0,64	0,52	0,49	0,86	0,58	0,42	0,38	0,46	0,36	0,32	1,00	1,00	1,00
	900	0,90	0,66	0,53	0,50	0,88	0,60	0,43	0,39	0,47	0,37	0,33	1,00	1,00	1,00
	2100	0,91	0,67	0,53	0,51	0,90	0,62	0,44	0,40	0,48	0,38	0,34	1,00	1,00	1,00
21	300	0,86	0,62	0,50	0,47	0,83	0,55	0,40	0,35	0,42	0,31	0,29	1,00	1,00	1,00
	900	0,87	0,63	0,50	0,47	0,84	0,56	0,41	0,36	0,43	0,32	0,29	1,00	1,00	1,00
	2100	0,88	0,64	0,51	0,48	0,85	0,57	0,42	0,37	0,44	0,32	0,30	1,00	1,00	1,00
22	300	1,00	0,90	0,79	0,74	0,97	0,81	0,62	0,56	0,82	0,68	0,64	1,00	1,00	1,00
	900	1,00	0,90	0,79	0,74	0,97	0,81	0,62	0,56	0,82	0,68	0,64	1,00	1,00	1,00
	2100	1,00	0,90	0,79	0,74	0,97	0,81	0,62	0,56	0,82	0,68	0,64	1,00	1,00	1,00
23	300	1,00	0,87	0,74	0,70	1,00	0,86	0,69	0,64	0,80	0,65	0,63	1,00	1,00	1,00
	900	1,00	0,87	0,74	0,70	1,00	0,87	0,74	0,70	0,80	0,65	0,63	1,00	1,00	1,00
	2100	1,00	0,87	0,74	0,70	1,00	0,87	0,74	0,70	0,80	0,65	0,63	1,00	1,00	1,00

Uranium (U^{236})

i	E_n	Δu	σ_t	σ_f	ν	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{s(e)}$
1	6,5—10,5 *Мэв*	0,48	6,30	1,50	3,42	0,01	1,29	3,50	0,84	0,0014	0,025
2	4,0—6,5 *Мэв*	0,48	7,50	0,92	3,04	0,02	2,16	4,40	0,80	0,0017	0,025
3	2,5—4,0 *Мэв*	0,48	7,70	0,90	2,83	0,05	2,25	4,50	0,71	0,0025	0,028
4	1,4—2,5 *Мэв*	0,57	7,10	0,77	2,63	0,09	1,94	4,30	0,54	0,0040	0,030
5	0,8—1,4 *Мэв*	0,57	6,90	0,42	2,54	0,33	1,70	4,45	0,43	0,0048	0,037
6	0,4—0,8 *Мэв*	0,69	7,80	0,03	2,46	0,30	1,54	5,93	0,33	0,0056	0,048
7	0,2—0,4 *Мэв*	0,69	9,60	—	—	0,33	1,00	8,27	0,21	0,0066	0,079
8	0,1—0,2 *Мэв*	0,69	11,5	—	—	0,40	0,52	10,6	0,12	0,0074	0,114
9	46,5—100 *кэв*	0,77	13,0	—	—	0,60	0,18	12,2	0,07	0,0078	0,124
10	21,5—46,5 *кэв*	0,77	14,0	—	—	0,80	0,00	13,2	0,04	0,0081	0,139
11	10,0—21,5 *кэв*	0,77	14,5	—	—	1,10	—	13,4	0,02	0,0082	0,143
12	4,65—10,0 *кэв*	0,77	16,0	—	—	1,60	—	14,4	0,01	0,0083	0,155
13	2,15—4,65 *кэв*	0,77	18,0	—	—	2,50	—	15,5	0,00	0,0084	0,169
14	1,0—2,15 *эв*	0,77	21,5	—	—	4,00	—	17,5	0,00	0,0084	0,191
15	465—1000 *эв*	0,77	29,0	—	—	6,00	—	23,0	0,00	0,0084	0,251
16	215—465 *эв*	0,77	47,0	—	—	10,0	—	37,0	0,00	0,0084	0,404
17	100—215 *эв*	0,77	51,0	—	—	14,5	—	36,5	0,00	0,0084	0,398
18	46,5—100 *эв*	0,77	82,0	—	—	30,0	—	52,0	0,00	0,0084	0,567
19	21,5—46,5 *эв*	0,77	76,0	—	—	45,0	—	31,0	0,00	0,0084	0,338
20	10,0—21,5 *эв*	0,77	10,1	—	—	0,10	—	10,0	0,00	0,0084	0,109
21	4,65—10,0 *эв*	0,77	330	—	—	300	—	30,0	0,00	0,0084	0,327
22	2,15—4,65 *эв*	0,77	12,8	—	—	2,80	—	10,0	0,00	0,0084	0,109
23	1,0—2,15 *эв*	0,77	11,3	—	—	1,30	—	10,0	0,00	0,0084	0,109
24	0,465—1,0 *эв*	0,77	11,6	—	—	1,60	—	10,0	0,00	0,0084	0,109
25	0,215—0,465 *эв*	0,77	12,2	—	—	2,20	—	10,0	0,00	0,0084	0,109
T	0,0252 *эв*	—	17,0	—	—	7,00	—	10,0	0,00	—	—

i	$\sigma_{in}(i, i+k)$ при k, равном									
	0	1	2	3	4	5	6	7	8	9
1	0,00	0,01	0,07	0,30	0,47	0,51	0,28	0,11	0,03	0,01
2	0,02	0,09	0,34	0,60	0,64	0,32	0,11	0,03	0,01	—
3	0,05	0,25	0,57	0,74	0,40	0,17	0,05	0,02	—	—
4	0,14	0,58	0,74	0,33	0,11	0,04	—	—	—	—
5	0,84	0,47	0,26	0,10	0,03	—	—	—	—	—
6	1,21	0,30	0,02	0,01	—	—	—	—	—	—
7	0,69	0,29	0,02	—	—	—	—	—	—	—
8	0,29	0,23	—	—	—	—	—	—	—	—
9	0,07	0,08	0,03	—	—	—	—	—	—	—

i	T °K	f_c при σ_0, равной				f_t при σ_0, равной			f_e при σ_0, равной		
		10^3	10^4	10^6	10^8	10^4	10^6	10^8	10^4	10^6	10^8
11	300	1,00	1,00	0,98	0,97	1,00	1,00	0,98	1,00	1,00	0,99
	900	1,00	1,00	1,00	0,98	1,00	1,00	1,00	1,00	1,00	1,00
	2100	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
12	300	1,00	1,00	0,97	0,92	1,00	0,99	0,94	1,00	0,99	0,97
	900	1,00	1,00	1,00	0,95	1,00	1,00	0,98	1,00	1,00	0,99
	2100	1,00	1,00	1,00	0,99	1,00	1,00	1,00	1,00	1,00	1,00
13	300	1,00	1,00	0,95	0,80	1,00	0,97	0,86	1,00	0,99	0,93
	900	1,00	1,00	0,98	0,87	1,00	0,99	0,90	1,00	0,99	0,96
	2100	1,00	1,00	0,99	0,94	1,00	1,00	0,95	1,00	1,00	0,99
14	300	1,00	0,99	0,92	0,62	1,00	0,93	0,73	1,00	0,98	0,86
	900	1,00	1,00	0,97	0,72	1,00	0,97	0,78	1,00	0,99	0,89
	2100	1,00	1,00	0,99	0,82	1,00	1,00	0,83	1,00	1,00	0,94
15	300	1,00	0,97	0,87	0,45	1,00	0,86	0,59	1,00	0,94	0,78
	900	1,00	0,98	0,92	0,55	1,00	0,91	0,62	1,00	0,97	0,80
	2100	1,00	0,99	0,96	0,64	1,00	0,96	0,65	1,00	0,99	0,86
16	300	1,00	0,89	0,49	0,15	0,82	0,45	0,28	0,91	0,62	0,38
	900	1,00	0,92	0,57	0,18	0,87	0,52	0,28	0,94	0,68	0,40
	2100	1,00	0,95	0,66	0,23	0,90	0,60	0,29	0,96	0,75	0,43
17	300	0,99	0,87	0,49	0,17	0,78	0,40	0,25	0,89	0,58	0,36
	900	1,00	0,91	0,56	0,20	0,85	0,45	0,26	0,92	0,63	0,38
	2100	1,00	0,94	0,64	0,26	0,89	0,52	0,27	0,95	0,69	0,41
18	300	0,97	0,76	0,30	0,083	0,67	0,24	0,16	0,81	0,44	0,26
	900	0,97	0,82	0,37	0,10	0,79	0,27	0,16	0,86	0,45	0,27
	2100	0,99	0,87	0,45	0,12	0,85	0,32	0,16	0,90	0,56	0,29
19	300	0,97	0,76	0,39	0,13	0,73	0,31	0,18	0,79	0,52	0,38
	900	0,99	0,85	0,46	0,16	0,81	0,36	0,18	0,88	0,57	0,39
	2100	0,99	0,90	0,56	0,21	0,88	0,41	0,19	0,92	0,64	0,42
20	300	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
	900	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
	2100	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
21	300	0,94	0,65	0,23	0,080	0,46	0,13	0,073	0,73	0,46	0,36
	900	0,95	0,70	0,28	0,088	0,60	0,14	0,074	0,77	0,48	0,36
	2100	0,97	0,77	0,34	0,096	0,72	0,16	0,074	0,81	0,53	0,37

Uranium (U^{238})

i	E_n	Δu	σ_t	σ_f	ν	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_{з(e)}$
1	6,5—10,5 *Мэв*	0,48	6,30	1,00	3,48	0,00	1,80	3,50	0,84	0,0013	0,023
2	4,0—6,5 *Мэв*	0,48	7,50	0,58	3,09	0,01	2 51	4,40	0,80	0,0017	0,025
3	2,5—4,0 *Мэв*	0,48	7,70	0 58	2,87	0,02	2 60	4,50	0,71	0,0024	0,027
4	1,4—2,5 *Мэв*	0,57	7,10	0,49	2,67	0,06	2,25	4,30	0,53	0,0039	0,029
5	0,8—1,4 *Мэв*	0,57	6,90	0,02	2,58	0,13	2,15	4,60	0,42	0,0049	0,040
6	0,4—0,8 *Мэв*	0,69	7,80	—	—	0,13	1,65	6,02	0,33	0,0056	0,049
7	0,2—0,4 *Мэв*	0,69	9,60	—	—	0,15	1,05	8,40	0,21	0,0066	0,080
8	0,1—0,2 *Мэв*	0,69	11,5	—	—	0,22	0,55	10,7	0,12	0,0074	0,115
9	46,5—100 *кэв*	0,77	12,8	—	—	0,35	0,19	12,3	0,07	0,0078	0,125
10	21,5—46,5 *кэв*	0,77	13,5	—	—	0,46	—	13,0	0,04	0,0081	0,137
11	10,0—21,5 *кэв*	0,77	14,0	—	—	0,60	—	13,4	0,02	0,0082	0,143
12	4,65—10,0 *кэв*	0,77	15,5	—	—	0,78	—	14,7	0,01	0,0083	0,158
13	2,15—4,65 *кэв*	0,77	16,5	—	—	1 20	—	15,3	0,00	0,0084	0,167
14	1,0—2,15 *кэв*	0,77	18,0	—	—	2,10	—	15,9	0,00	0,0084	0,174
15	465—1000 *эв*	0,77	23,0	—	—	3,60	—	19,4	0,00	0,0084	0,212
16	215—465 *эв*	0,77	18,5	—	—	4,50	—	14,0	0,00	0,0084	0,153
17	100—215 *эв*	0,77	80,0	—	—	17,0	—	63,0	0,00	0,0084	0,687
18	46,5—100 *эв*	0,77	40,0	—	—	15,0	—	25,0	0,00	0,0084	0,273
19	21,5—46,5 *эв*	0,77	140	—	—	58,0	—	82,0	0,00	0,0084	0,895
20	10,0—21,5 *эв*	0,77	120	—	—	82,0	—	38,0	0,00	0,0084	0,415
21	4,65—10,0 *эв*	0,77	190	—	—	171	—	19,0	0,00	0,0084	0,207
22	2,15—4,65 *эв*	0,77	9,54	—	—	0,54	—	9,00	0,00	0,0084	0,0982
23	1,0—2,15 *эв*	0,77	9,47	—	—	0,47	—	9,00	0,00	0,0084	0,0982
24	0,465—1,0 *эв*	0,77	9 58	—	—	0,58	—	9,00	0,00	0,0084	0,0982
25	0,215—0,465 *эв*	0,77	9,90	—	—	0,90	—	9,00	0,00	0,0084	0,0982
T	0,0252 *эв*	0 77	11,7	—	—	2,71	—	9,00	0,00	—	—

i	$\sigma_{in}(i, i+k)$ при k, равном									
	0	1	2	3	4	5	6	7	8	9
1	0,00	0,01	0,11	0,41	0,65	0,75	0,43	0,16	0,05	0,02
2	0,02	0,10	0,40	0,70	0,73	0,38	0,13	0,04	0,01	—
3	0,06	0,29	0,66	0,84	0,47	0 20	0,06	0,02	—	—
4	0,14	0,58	0,82	0,45	0,19	0,06	0,01	—	—	—
5	1,15	0,49	0,34	0,13	0,03	0,01	—	—	—	—
6	1,31	0,31	0,00	0,02	0,01	—	—	—	—	—
7	0,74	0,29	0,02	—	—	—	—	—	—	—
8	0,32	0,23	—	—	—	—	—	—	—	—
9	0,07	0,09	0,03	—	—	—	—	—	—	—

l	T °K	f_c при σ_0, равной						f_l при σ_0, равной				f_e при σ_0, равной			
		∞	10^4	10^3	10^2	10	0	10^3	10^2	10	0	10^3	10^2	10	0
10	300	1,00	1,00	1,00	0,99	0,98	0,93	1,00	1,00	0,98	0,97	1,00	1,00	0,99	0,98
	900	1,00	1,00	1,00	0,99	0,98	0,96	1,00	1,00	1,00	0,98	1,00	1,00	0,99	0,98
	2100	1,00	1,00	1,00	1,00	1,00	0,99	1,00	1,00	1,00	0,99	1,00	1,00	1,00	1,00
11	300	1,00	1,00	1,00	0,98	0,89	0,80	1,00	0,99	0,96	0,92	1,00	1,00	0,97	0,93
	900	1,00	1,00	1,00	0,99	0,95	0,90	1,00	1,00	0,98	0,93	1,00	1,00	0,97	0,95
	2100	1,00	1,00	1,00	1,00	0,99	0,97	1,00	1,00	0,99	0,94	1,00	1,00	0,99	0,98
12	300	1,00	1,00	0,99	0,92	0,75	0,63	0,99	0,98	0,87	0,73	0,99	0,98	0,91	0,85
	900	1,00	1,00	0,99	0,95	0,86	0,77	1,00	0,99	0,89	0,73	1,00	0,98	0,93	0,87
	2100	1,00	1,00	1,00	0,98	0,93	0,87	1,00	1,00	0,93	0,73	1,00	1,00	0,95	0,88
13	300	1,00	1,00	0,96	0,82	0,56	0,46	0,95	0,88	0,75	0,60	0,98	0,94	0,84	0,70
	900	1,00	1,00	0,98	0,89	0,66	0,55	0,96	0,90	0,78	0,61	0,99	0,95	0,87	0,73
	2100	1,00	1,00	1,00	0,95	0,79	0,67	0,97	0,94	0,82	0,62	1,00	0,99	0,92	0,76
14	300	1,00	0,99	0,89	0,63	0,34	0,29	0,91	0,74	0,64	0,50	0,95	0,84	0,74	0,60
	900	1,00	1,00	0,93	0,74	0,43	0,36	0,92	0,78	0,65	0,51	0,97	0,86	0,77	0,63
	2100	1,00	1,00	0,97	0,82	0,51	0,42	0,93	0,82	0,68	0,53	0,99	0,91	0,82	0,66
15	300	1,00	0,97	0,81	0,42	0,23	0,17	0,84	0,60	0,53	0,43	0,86	0,66	0,56	0,48
	900	1,00	0,98	0,87	0,52	0,29	0,21	0,85	0,64	0,54	0,43	0,90	0,70	0,58	0,49
	2100	1,00	1,00	0,93	0,60	0,34	0,26	0,87	0,68	0,55	0,44	0,90	0,70	0,60	0,50
16	300	1,00	0,94	0,65	0,27	0,136	0,106	0,87	0,60	0,50	0,46	0,84	0,73	0,68	0,63
	900	1,00	0,95	0,74	0,35	0,18	0,132	0,92	0,63	0,51	0,46	0,88	0,75	0,70	0,64
	2100	1,00	0,97	0,83	0,45	0,23	0,17	0,95	0,66	0,52	0,46	0,92	0,78	0,72	0,65
17	300	1,00	0,83	0,35	0,13	0,063	0,049	0,38	0,17	0,14	0,070	0,37	0,23	0,19	0,12
	900	1,00	0,86	0,38	0,15	0,071	0,053	0,45	0,17	0,15	0,070	0,38	0,24	0,20	0,12
	2100	1,00	0,89	0,44	0,17	0,081	0,063	0,51	0,18	0,16	0,070	0,40	0,25	0,21	0,12
18	300	1,00	0,81	0,30	0,108	0,052	0,042	0,39	0,29	0,25	0,22	0,54	0,45	0,42	0,38
	900	1,00	0,87	0,33	0,12	0,055	0,044	0,44	0,30	0,25	0,22	0,54	0,45	0,42	0,38
	2100	1,00	0,94	0,37	0,13	0,061	0,049	0,48	0,30	0,26	0,22	0,54	0,45	0,42	0,38
19	300	1,00	0,60	0,19	0,058	0,029	0,023	0,15	0,096	0,078	0,047	0,29	0,17	0,14	0,10
	900	1,00	0,67	0,23	0,060	0,029	0,023	0,16	0,096	0,078	0,047	0,33	0,18	0,14	0,10
	2100	1,00	0,75	0,28	0,070	0,029	0,023	0,17	0,096	0,078	0,047	0,37	0,19	0,15	0,10
20	300	1,00	0,66	0,23	0,065	0,030	0,023	0,17	0,11	0,087	0,075	0,43	0,31	0,28	0,24
	900	1,00	0,73	0,28	0,073	0,030	0,023	0,20	0,11	0,087	0,075	0,47	0,31	0,28	0,24
	2100	1,00	0,82	0,36	0,080	0,030	0,023	0,23	0,11	0,087	0,075	0,51	0,32	0,28	0,24
21	300	1,00	0,71	0,27	0,084	0,041	0,034	0,16	0,093	0,072	0,059	0,64	0,54	0,52	0,49
	900	1,00	0,78	0,33	0,089	0,041	0,034	0,18	0,094	0,072	0,059	0,66	0,55	0,52	0,49
	2100	1,00	0,86	0,40	0,105	0,041	0,034	0,21	0,095	0,072	0,059	0,69	0,56	0,52	0,49

Plutonium (Pu^{239})

i	E_n	Δu	σ_t	σ_f	ν	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_э(e)$
1	6,5—10,5 *Мэв*	0,48	6,70	2,20	3,86	0,01	0,64	3,85	0,84	0,0013	0,026
2	4,0—6,5 *Мэв*	0,48	7,70	1,85	3,51	0,02	1,28	4,55	0,80	0,0017	0,026
3	2,5—4,0 *Мэв*	0,48	7,90	1,97	3,27	0,03	1,25	4,65	0,71	0,0024	0,028
4	1,4—2,5 *Мэв*	0,57	7,30	1,95	3,12	0,04	1,16	4,15	0,55	0,0037	0,027
5	0,8—1,4 *Мэв*	0,57	7,30	1,80	3,01	0,06	1,14	4,30	0,45	0,0046	0,035
6	0,4—0,8 *Мэв*	0,69	8,30	1,68	2.95	0,11	1,16	5,35	0,35	0,0054	0,042
7	0,2—0,4 *Мэв*	0,69	9,90	1,66	2.91	0,17	0,95	7.12	0,23	0,0064	0,066
8	0,1—0,2 *Мэв*	0,69	11,3	1,68	2,89	0,24	0,75	8,63	0,1[illegible]	0,0072	0,090
9	46,5—100 *кэв*	0,77	12,5	1,85	2.88	0,40	0,55	9,70	0,[illegible]	0,0077	0,097
10	21,5—46,5 *кэв*	0,77	14,0	2,15	2,87	0,71	0,25	10,89	0,04	0,0080	0,113
11	10,0—21,5 *кэв*	0,77	15,0	2,40	2,87	1,08	0,10	11,42	0,02	0,0081	0,120
12	4,65—10,0 *кэв*	0,77	16,5	2 50	2,87	1,25	—	12,75	0,01	0,0082	0,137
13	2,15—4,65 *кэв*	0,77	18,0	3,40	2,87	1,90	—	12,7	0,00	0,0083	0,136
14	1,0—2,15 *кэв*	0,77	19,5	4,20	2,87	2,60	—	12,7	0,00	0,0083	0,137
15	465—1000 *эв*	0,77	26,0	7,60	2,87	5,00	—	13,4	0,00	0,0083	0,144
16	215—465 *эв*	0,77	36,5	13,0	2,87	9,1	—	14,4	0,00	0,0083	0,155
17	100—215 *эв*	0,77	48,0	19,0	2,87	14,0	—	15,0	0,00	0,0083	0,162
18	46,5—100 *эв*	0,77	127	61,0	2,87	46,0	—	20,0	0,00	0,0083	0,216
19	21,5—46,5 *эв*	0,77	68,0	22,0	2,87	31,0	—	15,0	0,00	0,0083	0,162
20	10,0—21,5 *эв*	0,77	194	110	2,87	72,0	—	12,0	0,00	0,0083	0,129
21	4,65—10,0 *эв*	0,77	90,5	45,0	2,87	35,0	—	10,5	0,00	0,0083	0,113
22	2,15—4,65 *эв*	0,77	23,0	12,0	2,87	1,0	—	10,0	0,00	0,0083	0,108
23	1,0—2,15 *эв*	0,77	38,0	24,0	2,87	3,0	—	11,0	0,00	0,0083	0,119
24	0,465—1,0 *эв*	0,77	189	103	2,87	73,0	—	13,3	0,00	0,0083	0,143
25	0,215—0,465 *эв*	0,77	2896	1670	2,87	1210	—	15,7	0,00	0,0083	0,169
T	0,0252 *эв*	—	1038	742	2,87	286	—	9,5	0,00	—	—

i	$\sigma_{in}(i, i+k)$ при k, равном									
	0	1	2	3	4	5	6	7	8	9
1	0,00	0,00	0,04	0,15	0,26	0,32	0,18	0,07	0,03	0,01
2	0,01	0,05	0,20	0,36	0,36	0,18	0,08	0,03	0,01	—
3	0,04	0,15	0,31	0,40	0,22	0,09	0,03	0,01	—	—
4	0,10	0,20	0,42	0,27	0,12	0,04	0,01	—	—	—
5	0,30	0,43	0,23	0,13	0,04	0,01	—	—	—	—
6	0,59	0,44	0,09	0,03	0,01	—	—	—	—	—
7	0,76	0,16	0,02	0,01	—	—	—	—	—	—
8	0,60	0,15	—	—	—	—	—	—	—	—
9	0,43	0,12	—	—	—	—	—	—	—	—
10	0,11	0,14	—	—	—	—	—	—	—	—
11	0,10	—	—	—	—	—	—	—	—	—

i	T °K	I_f при σ_0, равной				I_c при σ_0, равной				I_f при σ_0, равной			I_c при σ_0, равной		
		10^6	10^3	10	0	10^6	10^3	10	0	10^3	10	0	10^3	10	0
11	300	1,00	1,00	0,96	0,93	1,00	1,00	0,95	0,92	1,00	0,95	0,94	1,00	1,00	0,99
	900	1,00	1,00	0,98	0,97	1,00	1,00	0,98	0,96	1,00	0,98	0,97	1,00	1,00	1,00
	2100	1,00	1,00	1,00	0,98	1,00	1,00	1,00	0,98	1,00	1,00	0,99	1,00	1,00	1,00
12	300	1,00	0,98	0,89	0,84	1,00	0,98	0,88	0,82	0,97	0,90	0,87	1,00	0,97	0,96
	900	1,00	0,99	0,91	0,88	1,00	0,59	0,92	0,86	0,98	0,95	0,90	1,00	0,98	0,97
	2100	1,00	1,00	0,96	0,91	1,00	1,00	0,96	0,90	0,99	0,98	0,94	1,00	0,99	0,98
13	300	1,00	0,93	0,73	0,64	1,00	0,93	0,72	0,62	0,92	0,83	0,76	0,98	0,94	0,92
	900	1,00	0,95	0,78	0,69	1,00	0,95	0,79	0,68	0,94	0,90	0,80	0,99	0,95	0,93
	2100	1,00	0,98	0,86	0,73	1,00	0,98	0,87	0,74	0,97	0,95	0,85	1,00	0,97	0,94
14	300	0,98	0,87	0,62	0,49	0,98	0,85	0,60	0,46	0,84	0,71	0,64	0,96	0,92	0,89
	900	0,99	0,91	0,68	0,55	0,99	0,89	0,66	0,52	0,87	0,76	0,69	0,97	0,93	0,90
	2100	1,00	0,93	0,71	0,61	1,00	0,92	0,72	0,58	0,91	0,82	0,75	0,98	0,94	0,91
15	300	0,96	0,80	0,51	0,38	0,95	0,72	0,44	0,32	0,74	0,58	0,51	0,93	0,86	0,83
	900	0,97	0,86	0,58	0,44	0 97	0,79	0,51	0,38	0,80	0,63	0,56	0,95	0,87	0,84
	2100	0,99	0,92	0,65	0,50	0,99	0,86	0,58	0,44	0,87	0,69	0,62	0,96	0,89	0,86
16	300	0,91	0,68	0,38	0,29	0,90	0,57	0,30	0,21	0,64	0,46	0,40	0,87	0,79	0,76
	900	0,94	0,76	0,46	0,34	0,93	0,65	0,38	0,26	0,70	0,52	0,44	0,89	0,82	0,78
	2100	0,96	0,84	0,55	0,39	0,96	0,73	0,47	0,31	0,76	0,59	0,49	0,92	0,84	0,80
17	300	0,84	0,54	0,27	0,20	0,79	0,42	0,20	0,14	0,52	0,35	0,31	0,81	0,73	0,71
	900	0 88	0,59	0,30	0,22	0,83	0,47	0,23	0,16	0,57	0,38	0,32	0,82	0,74	0,72
	2100	0,91	0,63	0,32	0,23	0,86	0,51	0,25	0,18	0,61	0,40	0,33	0,84	0,75	0,73
18	300	0,66	0,32	0,18	0,16	0,55	0,22	0,11	0,10	0,30	0,20	0,16	0,61	0,55	0,55
	900	0.74	0,35	0,19	0,17	0,63	0,25	0,12	0,11	0,32	0,21	0,17	0,63	0,56	0,55
	2100	0,81	0,38	0,20	0,18	0,71	0,29	0,13	0,12	0,34	0,22	0,18	0,65	0,57	0,56
19	300	0,70	0,33	0,19	0,16	0,65	0,28	0,15	0,13	0,33	0,21	0,19	0,76	0,72	0,71
	900	0,77	0,37	0,21	0,18	0,72	0,32	0,17	0,15	0,36	0,23	0,21	0,77	0,72	0,72
	2100	0,85	0,41	0,22	0,20	0,81	0,36	0,19	0,17	0,39	0,25	0,23	0,79	0,73	0,72
20	300	0,68	0,33	0,19	0,17	0,65	0,29	0,18	0,16	0,18	0,11	0,10	0,88	0,86	0,86
	900	0,73	0,36	0,20	0,18	0,70	0,33	0,19	0,17	0,23	0,13	0,11	0,89	0,87	0,86
	2100	0,80	0,39	0,21	0,19	0,77	0,36	0,20	0,18	0,27	0,15	0,12	0,89	0,87	0,86
21	300	0,67	0,33	0,20	0,18	0,65	0,31	0,19	0,17	0,20	0,18	0,17	0,96	0,96	0,96
	900	0,71	0,35	0,21	0,19	0,69	0,33	0,20	0,18	0,23	0,19	0,18	0,97	0,96	0,96
	2100	0,76	0,37	0,22	0,20	0,74	0,35	0,21	0,19	0,25	0,20	0,19	0,97	0,96	0,96
24	300	0,94	0,79	0,70	0,69	0,77	0,62	0,53	0,52	0,54	0,47	0,45	0,94	0,89	0,88
	900	0,94	0,79	0,70	0,69	0,77	0,62	0,53	0,52	0,54	0,47	0,45	0,94	0,89	0,88
	2100	0,94	0,79	0,70	0,69	0,77	0,62	0,53	0,52	0,54	0,47	0,45	0,94	0,89	0,88
25	300	0,68	0,61	0,59	0,59	0,68	0,57	0,56	0,56	0,33	0,30	0,30	0,85	0,84	0,84
	900	0,68	0,61	0,59	0,59	0,68	0,57	0,56	0,56	0,33	0,30	0,30	0,85	0,84	0,84
	2100	0,68	0,61	0,59	0,59	0,68	0,57	0,56	0,56	0,33	0,30	0,30	0,85	0,84	0,84

BLANK PAGE

Plutonium (Pu^{240})

i	E_n	Δu	σ_t	σ_f	ν	σ_c	σ_{in}	σ_e	μ_e	ξ	σ_3 (e)
1	6,4—10,5 *Мэв*	0,48	6,30	2,00	3.80	0,01	0,84	3,45	0,84	0,0013	0,023
2	4,0—6,5 *Мэв*	0,48	7,50	1,55	3.44	0,02	1,58	4.35	0,80	0,0017	0,025
3	2,5—4,0 *Мэв*	0,48	7,70	1,62	3,24	0,04	1,59	4,45	0,71	0,0024	0,026
4	1,4—2,5 *Мэв*	0,57	7,10	1,60	3,05	0,09	1.46	3,95	0,53	0,0039	0,027
5	0,8—1,4 *Мэв*	0,57	6,90	1,50	2,94	0,24	0,97	4,19	0,42	0,0048	0,035
6	0,4—0,8 *Мэв*	0,69	8,00	0,58	2,88	0,26	1,27	5,89	0,33	0,0056	0,048
7	0,2—0,4 *Мэв*	0,69	10,0	0,12	2,84	0,34	0,95	8,59	0,21	0,0066	0,082
8	0,1—0,2 *Мэв*	0,69	11,5	0,05	2,82	0,45	0,50	10,5	0,12	0,0073	0,111
9	46,5—100 *кэв*	0,77	12,5	0,03	2,82	0,65	0,17	11,7	0,07	0,0077	0,117
10	21,5—46,5 *кэв*	0,77	13,5	0,02	2,81	0,90	—	12,6	0,04	0,0080	0,130
11	10,0—21,5 *кэв*	0,77	14,5	0,02	2,81	1,30	—	13,2	0,02	0,0081	0,139
12	4,65—10,0 *кэв*	0,77	15,5	0,02	2,81	1,80	—	13,7	0,01	0,0082	0,146
13	2,15—4,65 *кэв*	0,77	16,5	—	—	2,70	—	13,8	0,00	0,0083	0,149
14	1,0—2,15 *кэв*	0,77	18,0	—	—	4,50	—	13,5	0,00	0,0083	0,146
15	465—1000 *эв*	0,77	25,0	—	—	6,50	—	18,5	0,00	0,0083	0,199
16	215—465 *эв*	0,77	30,0	—	—	12,0	—	18,0	0,00	0,0083	0,194
17	100—215 *эв*	0,77	36,0	—	—	18,0	—	18,0	0,00	0,0083	0,194
18	46,5—100 *эв*	0,77	108	—	—	49,0	—	59,0	0,00	0,0083	0,639
19	21,5—46,5 *эв*	0,77	71,0	—	—	44,0	—	27,0	0,00	0,0083	0,291
20	10,0—21,5 *эв*	0,77	60,0	—	—	28,0	—	32,0	0,00	0,0083	0,345
21	4,65—10,0 *эв*	0,77	33,6	—	—	0,60	—	33,0	0,00	0,0083	0,356
22	2,15—4,65 *эв*	0,77	52,0	—	—	6,00	—	46,0	0,00	0,0083	0,496
23	1,0—2,15 *эв*	0,77	15250	—	—	14250	—	1000	0,00	0,0083	10.78
24	0,465—1,0 *эв*	0,77	1190	—	—	1110	—	80	0,00	0,0083	0,863
25	0,215—0,465 *эв*	0,77	170	—	—	160	—	10	0,00	0,0083	0,108
T	0,0252 *эв*	—	305	—	—	295	—	10	0,00	—	—

i	$\sigma_{in}(i, i+k)$ при k, равном								
	0	1	2	3	4	5	6	7	8
1	0,00	0,00	0,05	0,20	0,30	0,32	0,17	0,06	0,02
2	0,01	0,06	0,26	0,44	0,46	0,24	0,08	0,02	0,01
3	0,04	0,18	0,40	0,52	0,28	0,12	0,04	0,01	—
4	0,09	0,38	0,53	0,29	0,12	0,04	0,01	—	—
5	0,51	0,24	0,15	0,06	0,01	—	—	—	—
6	1,00	0,25	0,02	—	—	—	—	—	—
7	0,67	0,26	0,02	—	—	—	—	—	—
8	0,30	0,20	—	—	—	—	—	—	—
9	0,06	0,08	0,03	—	—	—	—	—	—

l	T °K	f_c при σ_c, равной					f_i при σ_i, равной				f_e при σ_e, равной			
		10^2	10^3	10^4	10^5	10^6	10^3	10^4	10^5	10^6	10^3	10^4	10^5	10^6
11	300	1,00	1,00	1,00	0,98	0,97	1,00	1,00	1,00	0,98	1,00	1,00	1,00	0,99
	900	1,00	1,00	1,00	1,00	0,98	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
	2100	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
12	300	1,00	1,00	1,00	0,97	0,92	1,00	1,00	0,99	0,94	1,00	1,00	0,99	0,97
	900	1,00	1,00	1,00	1,00	0,95	1,00	1,00	1,00	0,98	1,00	1,00	1,00	0,99
	2100	1,00	1,00	1,00	1,00	0,99	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
13	300	1,00	1,00	1,00	0,95	0,80	1,00	1,00	0,97	0,86	1,00	1,00	0,99	0,93
	900	1,00	1,00	1,00	0,98	0,87	1,00	1,00	0,99	0,90	1,00	1,00	0,99	0,96
	2100	1,00	1,00	1,00	0,99	0,94	1,00	1,00	1,00	0,95	1,00	1,00	1,00	0,99
14	300	1,00	1,00	0,99	0,92	0,62	1,00	1,00	0,93	0,73	1,00	1,00	0,98	0,86
	900	1,00	1,00	1,00	0,97	0,72	1,00	1,00	0,97	0,78	1,00	1,00	0,99	0,89
	2100	1,00	1,00	1,00	0,99	0,82	1,00	1,00	1,00	0,83	1,00	1,00	1,00	0,94
15	300	1,00	1,00	0,97	0,87	0,45	1,00	1,00	0,86	0,59	1,00	1,00	0,94	0,78
	900	1,00	1,00	0,98	0,92	0,55	1,00	1,00	0,91	0,62	1,00	1,00	0,97	0,80
	2100	1,00	1,00	0,99	0,96	0,64	1,00	1,00	0,96	0,65	1,00	1,00	0,99	0,86
16	300	1,00	1,00	0,92	0,58	0,20	1,00	0,84	0,50	0,29	1,00	0,92	0,65	0,40
	900	1,00	1,00	0,95	0,67	0,25	1,00	0,87	0,58	0,30	1,00	0,95	0,71	0,44
	2100	1,00	1,00	0,96	0,74	0,31	1,00	0,91	0,66	0,32	1,00	0,96	0,77	0,48
17	300	1,00	0,99	0,87	0,49	0,17	0,99	0,78	0,40	0,25	1,00	0,89	0,58	0,36
	900	1,00	1,00	0,91	0,56	0,20	0,99	0,85	0,45	0,26	1,00	0,92	0,63	0,38
	2100	1,00	1,00	0,94	0,64	0,26	1,00	0,89	0,52	0,27	1,00	0,95	0,69	0,41
18	300	1,00	0,97	0,78	0,35	0,11	0,93	0,64	0,24	0,13	0,97	0,79	0,42	0,24
	900	1,00	0,98	0,84	0,42	0,13	0,94	0,77	0,28	0,14	0,98	0,85	0,48	0,25
	2100	1,00	0,99	0,87	0,49	0,16	0,95	0,83	0,32	0,14	0,99	0,88	0,54	0,27
19	300	1,00	0,97	0,77	0,34	0,10	0,93	0,69	0,29	0,18	0,98	0,84	0,55	0,42
	900	1,00	0,98	0,84	0,41	0,13	0,95	0,80	0,32	0,18	0,99	0,89	0,60	0,43
	2100	1,00	0,99	0,87	0,48	0,16	0,96	0,85	0,37	0,19	0,99	0,91	0,64	0,44
20	300	1,00	1,00	0,87	0,45	0,16	1,00	0,81	0,43	0,29	1,00	0,98	0,91	0,86
	900	1,00	1,00	0,91	0,55	0,17	1,00	0,87	0,50	0,30	1,00	0,99	0,92	0,86
	2100	1,00	1,00	0,93	0,63	0,21	1,00	0,89	0,57	0,30	1,00	0,99	0,94	0,87
23	300	0,91	0,54	0,16	0,04	0,02	0,31	0,05	0,02	0,01	0,55	0,17	0,06	0,03
	900	0,91	0,54	0,16	0,04	0,02	0,31	0,05	0,02	0,01	0,55	0,17	0,06	0,03
	2100	0,91	0,54	0,16	0,04	0,02	0,31	0,05	0,02	0,01	0,55	0,17	0,06	0,03
24	300	1,00	0,97	0,83	0,56	0,43	0,96	0,69	0,39	0,32	0,98	0,84	0,59	0,47
	900	1,00	0,97	0,83	0,56	0,43	0,96	0,69	0,39	0,32	0,98	0,84	0,59	0,47
	2100	1,00	0,97	0,83	0,56	0,43	0,96	0,69	0,39	0,32	0,98	0,84	0,59	0,47

Plutonium (Pu^{241})

i	E_n	Δu	σ_t	σ_f	ν	σ_c	σ_{in}	σ_e	μ_e	ξ	σ_3 (e)
1	6,5—10,5 Мэв	0,48	6,70	1,70	4,00	0,00	1,15	3,85	0,84	0,0013	0,026
2	4,0—6,5 Мэв	0,48	7,70	1,35	3,62	0,01	1,79	4,55	0,80	0,0016	0,025
3	2,5—4,0 Мэв	0,48	7,90	1,40	3,41	0,02	1,83	4,65	0,71	0,0024	0,027
4	1,4—2,5 Мэв	0,57	7,30	1,45	3,21	0,03	1,67	4,15	0,55	0,0037	0,027
5	0,8—1,4 Мэв	0,57	7,30	1,30	3,11	0,06	1,64	4,30	0,45	0,0045	0,034
6	0,4—0,8 Мэв	0,69	8,30	1,30	3,04	0,09	1,20	5,71	0,35	0,0053	0,044
7	0,2—0,4 Мэв	0,69	10,0	1,60	3,00	0.16	0,60	7,64	0,23	0,0063	0,070
8	0,1—0,2 Мэв	0,69	11,5	2,10	2,98	0,26	0,30	8,84	0,13	0,0071	0,091
9	46,5—100 кэв	0,77	12,7	2,80	2,97	0,39	—	9,51	0,07	0,0076	0,094
10	21,5—46,5 кэв	0,77	14,4	3,80	2,96	0,61	—	10,0	0,04	0,0079	0,102
11	10,0—21,5 кэв	0,77	16,9	5,40	2,96	0,97	—	10,5	0,02	0,0080	0,110
12	4,65—10,0 кэв	0,77	18,8	6,50	2,96	1,30	—	11,0	0,01	0,0081	0,116
13	2,15—4,65 кэв	0,77	23,0	9.00	2,96	2,00	—	12,0	0,00	0,0082	0,128
14	1,0—2,15 кэв	0,77	27,9	12,0	2,96	2,90	—	13,0	0,00	0,0082	0,138
15	465—1000 эв	0,77	33,0	16,0	2,96	4,00	—	13,0	0,00	0,0082	0,138
16	215—465 эв	0,77	38,5	21,0	2,96	5,50	—	12,0	0,00	0,0082	0,128
17	100—215 эв	0,77	50,0	30,0	2,96	8,00	—	12,0	0,00	0,0082	0,128
18	46,5—100 эв	0,77	62,0	40,0	2,96	11,0	—	11,0	0,00	0,0082	0,117
19	21,5—46,5 эв	0,77	87,0	60,0	2,96	16,0	—	11,0	0,00	0,0082	0,117
20	10,0—21,5 эв	0,77	176	130	2,96	35,0	—	11,0	0,00	0,0083	0,117
21	4,65—10,0 эв	0,77	271	220	2,96	40,0	—	11,0	0,00	0,0082	0,117
22	2,15—4,65 эв	0,77	131	80	2,96	40,0	—	11,0	0,00	0,0082	0,117
23	1,0—2,15 эв	0,77	60,0	35	2,96	15,0	—	10,0	0,00	0,0082	0,107
24	0,465—1,0 эв	0,77	75,0	45	2,96	20,0	—	10,0	0,00	0,0082	0,107
25	0,215—0,465 эв	0,77	1160	850	2,96	300	—	10,5	0,00	0,0082	0,112
T	0,0252 эв	—	1430	1020	2,96	400	—	10,0	0,00	—	—

i	$\sigma_{in}(i, k)$ при k, равном										
	1	2	3	4	5	6	7	8	9	10	11
1	0,00	0,01	0,06	0,25	0,42	0,54	0,34	0,14	0,04	0,01	—
2	—	0,02	0,07	0,33	0,50	0,48	0,24	0,10	0,04	0,01	—
3	—	—	0,10	0,25	0,50	0,52	0,29	0,12	0,04	0,01	—
4	—	—	—	0,19	0,34	0,54	0,37	0,15	0,06	0,02	—
5	—	—	—	—	0,37	0,60	0,40	0,18	0,07	0,02	—
6	—	—	—	—	—	0,43	0,43	0,20	0,10	0,03	0,01
7	—	—	—	—	—	—	0,24	0,26	0,07	0,03	—
8	—	—	—	—	—	—	—	0,19	0,08	0,03	—

f_t, f_c, f_f and $f_e \sim 1$ at $\sigma_0 > 1000$ barn.

Plutonium (Pu^{242})

i	E_n	Δu	σ_t	σ_f	ν	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_3(c)$
1	6,5—10,5 *Мэв*	0,48	6,30	1,60	3,89	0,00	1,25	3,45	0,84	0,0013	0,023
2	4,0—6 5 *Мэв*	0,48	7,60	1,23	3,52	0,01	1,91	4,45	0,80	0,0016	0,024
3	2,5—4,0 *Мэв*	0,48	7,80	1,23	3,30	0,03	1,99	4,55	0,71	0,0024	0,027
4	1,4—2,5 *Мэв*	0,57	7,30	1,27	3,10	0,06	1,82	4,15	0,53	0,0038	0,028
5	0,8—1,4 *Мэв*	0,57	7,00	1,27	3,00	0,12	1,23	4,38	0,42	0,0048	0,037
6	0,4—0,8 *Мэв*	0,69	8,00	0,32	2 93	0,15	1,46	6,07	0,33	0,0055	0,048
7	0,2—0 4 *Мэв*	0,69	10 0	0,06	2 89	0,17	1,00	8,77	0,21	0,0065	0,083
8	0,1—0,2 *Мэв*	0,69	11,5	0,03	2,87	0 25	0,53	10,7	0,12	0,0072	0,112
9	46 5—100 *эв*	0,77	13,0	0,02	2,86	0,40	0,17	12,4	0,07	0,0076	0,122
10	21,5—46,5 *кэв*	0,77	13 5	0,02	2 85	0,50	0,00	13,0	0,04	0,0079	0,133
11	10,0—21,5 *кэв*	0,77	14 5	0,01	2,85	0,70	—	13,8	0 02	0,0080	0,143
12	4,65—10 0 *кэв*	0,77	15 5	0,01	2,85	1,00	—	14,5	0,01	0,0081	0,153
13	2,15—4,65 *кэв*	0,77	16 5	—	—	1,60	—	14,9	0,00	0,0082	0,159
14	1,0—2,15 *кэв*	0,77	18 0	—	—	2 80	—	15,2	0,00	0,0082	0,162
15	465—1000 *эв*	0,77	22,0	—	—	4 50	—	17,5	0,00	0,0082	0,186
16	215—465 *эв*	0,77	30	—	—	9,00	—	21,0	0,00	0,0082	0,224
17	100—215 *эв*	0,77	40	—	—	17,0	—	23 0	0,00	0,0082	0,245
18	46,5—100 *эв*	0,77	100	—	—	35,0	—	65,0	0,00	0,0082	0,692
19	21,5—46 5 *эв*	0,77	11,0	—	—	1,0	—	10,0	0,00	0,0082	0,106
20	10,0—21,5 *эв*	0,77	11,0	—	—	1,0	—	10,0	0,00	0 0082	0,106
21	4,65—10,0 *эв*	0,77	11,0	—	—	1,0	—	10,0	0,00	0,0082	0,106
22	2 15—4,65 *эв*	0,77	1400	—	—	1300	—	100	0,00	0,0082	1,06
23	1,0—2,15 *эв*	0,77	26 0	—	—	15,0	—	11,0	0,00	0,0082	0,117
24	0,465—1,0 *эв*	0,77	17,0	—	—	7,0	—	10,0	0,00	0,0082	0,106
25	0,215—0,465 *эв*	0,77	18,0	—	—	8 00	—	10,0	0,00	0,0082	0,106
T	0,0252 *эв*	—	35,0	—	—	25,0	—	10,0	0,00	0,0082	—

i	$\sigma_{in}(i,\ i+k)$ при k, равном									
	0	1	2	3	4	5	6	7	8	9
1	0,00	0,01	0,07	0,29	0,45	0,48	0,25	0,10	0,03	0,01
2	0,01	0,08	0,31	0,54	0,56	0,28	0,09	0,03	0,01	—
3	0,04	0,22	0,51	0,66	0,36	0,15	0,04	0,01	—	—
4	0,10	0,47	0,67	0,37	0,15	0,05	0,01	—	—	—
5	0,65	0,29	0,20	0,07	0,02	—	—	—	—	—
6	1,16	0,28	0,02	—	—	—	—	—	—	—
7	0,70	0,28	0,02	—	—	—	—	—	—	—
8	0,31	0,22	—	—	—	—	—	—	—	—
9	0,06	0,08	0,03	—	—	—	—	—	—	—

i	T °K	f_c при σ_0, равной			f_f при σ_0, равной			f_e при σ_0, равной		
		10^3	10^2	10^1	10^3	10^2	10^1	10^3	10^2	10^1
18	300	0,94	0,65	0,22	0,86	0,51	0,19	0,95	0,70	0,34
	900	0,96	0,72	0,26	0,87	0,66	0,20	0,97	0,76	0,38
	2100	0,97	0,77	0,31	0,89	0,73	0,22	0,98	0,81	0,42
22	300	0,85	0,46	0,17	0,71	0,26	0,095	0,87	0,51	0,25
	900	0,89	0,52	0,18	0,77	0,30	0,096	0,90	0,57	0,26
	2100	0,93	0,59	0,20	0,82	0,42	0,097	0,93	0,63	0,28

For other groups

f_c, f_f and $f_e \sim 1$ at $\sigma_0 > 1000$ barn.

Fission fragments of U^{235}

i	E_n	Δu	σ_f	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_з(e)$
1	6,5—10,5 *Мэв*	0,48	9,10	0,01	4,10	4,99	0,80	0,003	0,0312
2	4,0—6,5 *Мэв*	0,48	9,20	0,02	4,20	4,98	0,70	0,005	0,0519
3	2,5—4,0 *Мэв*	0,48	10,5	0,04	4,20	6,26	0,60	0,007	0,0913
4	1,4—2,5 *Мэв*	0,57	12,5	0,07	3,50	8,93	0,50	0,008	0,125
5	0,8—1,4 *Мэв*	0,57	14,0	0,09	2,30	11,6	0,40	0,010	0,204
6	0,4—0,8 *Мэв*	0,69	14,5	0,10	1,10	13,3	0,30	0,012	0,231
7	0,2—0,4 *Мэв*	0,69	14,0	0,14	0,30	13,6	0,20	0,014	0,276
8	0,1—0,2 *Мэв*	0,69	14,3	0,18	0,10	14,0	0,10	0,015	0,304
9	46,5—100 *кэв*	0,77	14,5	0,25	—	14,2	0,05	0,016	0,295
10	21,5—46,5 *кэв*	0,77	16,0	0,40	—	15,6	0,03	0,016	0,324
11	10,0—21,5 *кэв*	0,77	17,0	0,70	—	16,3	0,02	0,017	0,3599
12	4,65—10,0 *кэв*	0,77	18,0	1,00	—	17,0	0,01	0,017	0,375
13	2,15—4,65 *кэв*	0,77	20,0	1,60	—	18,4	0,01	0,017	0,406
14	1,0—2,15 *кэв*	0,77	22,0	2,60	—	19,4	0,01	0,017	0,428
15	465—1000 *эв*	0,77	25,5	4,50	—	21,0	0,01	0,017	0,464
16	215—465 *эв*	0,77	33,0	10,0	—	23,0	0,01	0,017	0,508
17	100—215 *эв*	0,77	34,0	9,0	—	25,0	0,01	0,017	0,552
18	46,5—100 *эв*	0,77	52,0	22,0	—	30,0	0,01	0,017	0,662
19	21,5—46,5 *эв*	0,77	49,0	22,0	—	27,0	0,01	0,017	0,596
20	10,0—21,5 *эв*	0,77	150	37,0	—	113	0,01	0,017	0,495
21	4,65—10 *эв*	0,77	129	89,0	—	40,0	0,01	0,017	0,883
22	2,15—4,65 *эв*	0,77	26,8	11,0	—	15,8	0,01	0,017	0,349
23	1,0—2,15 *эв*	0,77	43,8	28,0	—	15,8	0,01	0,017	0,349
24	0,465—1,0 *эв*	0,77	26,6	11,0	—	15,6	0,01	0,017	0,344
25	0,215—0,465 *эв*	0,77	27,6	12,0	—	15,6	0,01	0,017	0,344
T	0,0252 *эв*	—	55,6	40,0	—	15,6	0,01	—	—

j	$\sigma_{in}(j,\ j+k)$ при k, равном								
	0	1	2	3	4	5	6	7	8
1	0,00	0,04	0,26	0,98	1,20	1,00	0,46	0,12	0,04
2	0,02	0,13	0,76	1,20	1,21	0,57	0,22	0,07	0,02
3	0,24	0,86	0,95	1,07	0,71	0,28	0,07	0,02	—
4	0,33	0,91	1,14	0,59	0,35	0,13	0,05	—	—
5	0,54	0,91	0,47	0,24	0,11	0,03	—	—	—
6	0,46	0,44	0,16	0,03	0,01	—	—	—	—
7	0,15	0,12	0,03	—	—	—	—	—	—
8	0,05	0,04	0,01	—	—	—	—	—	—

j	T °K	I_c при σ_e, равной			I_t при σ_e, равной			I_e при σ_e, равной		
		10^4	10^6	10^8	10^4	10^6	10^8	10^4	10^6	10^8
18	300	1,00	0,98	0,85	1,00	0,99	0,91	1,00	1,00	0,99
	900	1,00	0,99	0,89	1,00	0,99	0,93	1,00	1,00	0,99
	2100	1,00	0,99	0,92	1,00	0,99	0,96	1,00	1,00	1,00
19	300	1,00	0,89	0,67	0,98	0,79	0,59	1,00	0,92	0,74
	900	1,00	0,91	0,70	1,00	0,81	0,63	1,00	0,93	0,76
	2100	1,00	0,93	0,75	1,00	0,84	0,67	1,00	0,94	0,78
20	300	0,91	0,65	0,41	0,84	0,45	0,30	0,91	0,64	0,39
	900	0,93	0,68	0,43	0,85	0,49	0,31	0,93	0,67	0,40
	2100	0,94	0,72	0,46	0,86	0,53	0,33	0,94	0,71	0,42
21	300	0,97	0,84	0,61	0,98	0,79	0,59	0,97	0,85	0,75
	900	0,99	0,88	0,67	0,98	0,83	0,65	0,99	0,88	0,80
	2100	1,00	0,92	0,73	0,99	0,88	0,70	0,99	0,91	0,86
22	300	1,00	0,96	0,81	1,00	0,96	0,86	1,00	1,00	1,00
	900	1,00	0,98	0,85	1,00	0,97	0,88	1,00	1,00	1,00
	2100	1,00	0,99	0,88	1,00	0,99	0,92	1,00	1,00	1,00
23	300	1,00	0,99	0,91	1,00	0,99	0,99	1,00	1,00	1,00
	900	1,00	0,99	0,91	1,00	0,99	0,99	1,00	1,00	1,00
	2100	1,00	0,99	0,91	1,00	0,99	0,99	1,00	1,00	1,00

Fission fragments of U^{235}

i	E_n	Δu	σ_t	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_з(e)$
1	6,5—10,5 *Мэв*	0,48	9,10	0,01	4,10	4,99	0,80	0,003	0,0312
2	4,0—6,5 *Мэв*	0,48	9,20	0,02	4,20	4,98	0,70	0,005	0,0519
3	2,5—4,0 *Мэв*	0,48	10,5	0,04	4,20	6,26	0,60	0,007	0,0913
4	1,4—2,5 *Мэв*	0,57	12,5	0,07	3,50	8,93	0,50	0,008	0,125
5	0,8—1,4 *Мэв*	0,57	14,0	0,10	2,30	11,6	0,40	0,010	0,204
6	0,4—0,8 *Мэв*	0,69	14,5	0,12	1,10	13,3	0,30	0,012	0,231
7	0,2—0,4 *Мэв*	0,69	14,0	0,16	0,30	13,5	0,20	0,014	0,274
8	0,1—0,2 *Мэв*	0,69	14,3	0,20	0,10	14,0	0,10	0,015	0,304
9	46,5—100 *кэв*	0,77	14,5	0,30	—	14,2	0,05	0,016	0,295
10	21,5—46,5 *кэв*	0,77	16,0	0,45	—	15,6	0,03	0,016	0,324
11	10,0—21,5 *кэв*	0,77	17,0	0,75	—	16,2	0,02	0,017	0,358
12	4,65—10,0 *кэв*	0,77	18,0	1,20	—	16,8	0.01	0,017	0,371
13	2,15—4,65 *кэв*	0,77	20,0	1,80	—	18,2	0,01	0,017	0,402
14	1,0—2,15 *кэв*	0,77	22,0	2,80	—	19,2	0,01	0,017	0,424
15	465—1000 *эв*	0,77	26,0	5,00	—	21,0	0,01	0,017	0,464
16	215—465 *эв*	0,77	34,0	11,0	—	23,0	0,01	0,017	0,508
17	100—215 *эв*	0,77	35,0	10,0	—	25,0	0,01	0,017	0,552
18	46,5—100 *эв*	0,77	55,0	25,0	—	30,0	0,01	0,017	0,662
19	21,5—46,5 *эв*	0,77	55,0	23,0	—	29,0	0,01	0,017	0,640
20	10,0—21,5 *эв*	0,77	130	33,0	—	97,0	0,01	0,017	2,142
21	4,65—10 *эв*	0,77	155	109	—	46,0	0,01	0,017	1,016
22	2,15—4,65 *эв*	0,77	29,6	13,0	—	16,6	0,01	0,017	0,366
23	1,0—2,15 *эв*	0,77	58,6	42,0	—	16,6	0,01	0,017	0,366
24	0,465—1,0 *эв*	0,77	29,4	13,0	—	16,4	0,01	0,017	0,362
25	0,215—0,465 *эв*	0,77	30,4	14,0	—	16,4	0,01	0,017	0,362
T	0,0252 *эв*	—	60,4	44,0	—	16,4	0,01	—	—

i	$\sigma_{in}(i, i+k)$ при k, равном								
	0	1	2	3	4	5	6	7	8
1	0,00	0,04	0,26	0,98	1,20	1,00	0,46	0,12	0,04
2	0,02	0,12	0,76	1,20	1,21	0,57	0,22	0,07	0,02
3	0,24	0,86	0,95	1,07	0,71	0,28	0,07	0,02	—
4	0,33	0,91	1,14	0,59	0,35	0,13	0,05	—	—
5	0,54	0,91	0,47	0,24	0,11	0,03	—	—	—
6	0,46	0,44	0,16	0,03	0,01	—	—	—	—
7	0,15	0,12	0,03	—	—	—	—	—	—
8	0,05	0,04	0,01	—	—	—	—	—	—

i	T °K	f_c при σ_0, равной			f_f при σ_0, равной			f_e при σ_0, равной		
		10^4	10^3	10^2	10^4	10^3	10^2	10^4	10^3	10^2
18	300	1,00	0,96	0,76	1,00	0,98	0,89	1,00	1,00	0,98
	900	1,00	0,97	0,80	1,00	0,98	0,92	1,00	1,00	0,99
	2100	1,00	0,98	0,83	1,00	0,99	0,95	1,00	1,00	0,99
19	300	1,00	0,88	0,63	1,00	0,81	0,54	1,00	0,91	0,72
	900	1,00	0,89	0,67	1,00	0,82	0,56	1,00	0,92	0,74
	2100	1,00	0,91	0,71	1,00	0,85	0,60	1,00	0,93	0,76
20	300	0,94	0,71	0,45	0,92	0,52	0,33	0,93	0,68	0,40
	900	0,94	0,74	0,47	0,93	0,56	0,34	0,94	0,72	0,42
	2100	0,95	0,77	0,57	0,95	0,59	0,38	0,95	0,75	0,51
21	300	1,00	0,56	0,46	0,97	0,65	0,43	1,00	0,66	0,60
	900	1,00	0,59	0,50	0,98	0,69	0,47	1,00	0,69	0,64
	2100	1,00	0,63	0,54	0,99	0,75	0,51	1,00	0,71	0,67
22	300	1,00	0,79	0,72	1,00	0,95	0,85	1,00	1,00	0,99
	900	1,00	0,81	0,75	1,00	0,96	0,87	1,00	1,00	0,99
	2100	1,00	0,85	0,81	1,00	0,97	0,92	1,00	1,00	1,00
23	300	1,00	0,97	0,87	0,99	0,98	0,98	1,00	1,00	1,00
	900	1,00	0,97	0,87	0,99	0,98	0,98	1,00	1,00	1,00
	2100	1,00	0,97	0,87	0,99	0,98	0,98	1,00	1,00	1,00

Fission fragments of Pu^{239}

i	E_n	Δu	σ_f	σ_c	σ_{in}	σ_e	μ_e	ξ	$\sigma_з(e)$
1	6,5—10,5 *Мэв*	0,48	9,10	0,01	4,10	4,99	0,80	0,003	0,0312
2	4,0—6,5 *Мэв*	0,48	9,20	0,02	4,20	4,98	0,70	0,005	0,0519
3	2,5—4,0 *Мэв*	0,48	10,5	0,04	4,20	6,26	0,60	0,007	0,0913
4	1,4—2,5 *Мэв*	0,57	12,5	0,07	3,50	8,93	0,50	0,008	0,1253
5	0,8—1,4 *Мэв*	0,57	14,0	0,11	2,30	11,6	0,40	0,010	0,204
6	0,4—0,8 *Мэв*	0,69	14,5	0,15	1,10	13,2	0,30	0,012	0,2295
7	0,2—0,4 *Мэв*	0,69	14,0	0,20	0,30	13,5	0,20	0,014	0,274
8	0,1—0,2 *Мэв*	0,69	14,3	0,25	0.10	14,0	0,10	0,015	0,304
9	46,5—100 *кэв*	0,77	14,5	0,40	—	14,1	0,05	0,016	0,293
10	21,5—46,5 *кэв*	0,77	16,0	0,55	—	15,4	0,03	0,016	0,320
11	10,0—21,5 *кэв*	0,77	17,0	0,90	—	16,1	0,02	0,017	0,355
12	4,65—10,0 *кэв*	0,77	18,0	1,50	—	16,5	0,01	0,017	0,364
13	2,15—4,65 *кэв*	0,77	20,0	2,20	—	17,8	0,01	0,017	0,393
14	1,0—2,15 *кэв*	0,77	22,0	3,20	—	18,8	0,01	0,017	0,415
15	465—1000 *эв*	0,77	26,5	5,50	—	21,0	0,01	0,017	0,464
16	215—465 *эв*	0,77	36,0	12,0	—	23,0	0,01	0,017	0,508
17	100—215 *эв*	0,77	37,0	12,0	—	25,0	0,01	0,017	0,552
18	46,5—100 *эв*	0,77	60,0	30,0	—	30,0	0,01	0,017	0,662
19	21,5—46,5 *эв*	0,77	50,0	24,0	—	26,0	0,01	0,017	0,574
20	10,0—21,5 *эв*	0,77	163	42,0	—	121	0,01	0,017	2,671
21	4,65—10 *эв*	0,77	189	138	—	51,0	0,01	0,017	1,126
22	2,15—4,65 *эв*	0,77	28,9	14,0	—	14,9	0,01	0,017	0,329
23	1,0—2,15 *эв*	0,77	90.1	75,0	—	15,1	0,01	0,017	0,333
24	0,465—1,0 *эв*	0,77	32,7	18,0	—	14,7	0,01	0,017	0,324
25	0,215—0,465 *эв*	0,77	29,7	15,0	—	14,7	0,01	0,017	0,324
T	0,0252 *эв*	—	62,7	48,0	—	14,7	0,01	0,017	0,324

l	$a_{in}(l, l+k)$ при k, равном								
	0	1	2	3	4	5	6	7	8
1	0,00	0,04	0,26	0,98	1,20	1,00	0,46	0,12	0,04
2	0,02	0,13	0,76	1,20	1,21	0,57	0,22	0,07	0,02
3	0,24	0,86	0,95	1,07	0,71	0,28	0,07	0,02	—
4	0,33	0,91	1,14	0,59	0,35	0,13	0,05	—	—
5	0,54	0,91	0,47	0,24	0,11	0,03	—	—	—
6	0,46	0,44	0,16	0,03	0,01	—	—	—	—
7	0,15	0,12	0,03	—	—	—	—	—	—
8	0,05	0,04	0,01	—	—	—	—	—	—

l	T °K	f_c при σ_0, равной			f_t при σ_0, равной			f_φ при σ_0, равной		
		10^4	10^6	10^8	10^4	10^6	10^8	10^4	10^6	10^8
18	300	1,00	0,93	0,86	1,00	0,98	0,88	1,00	0,99	0,98
	900	1,00	0,99	0,91	1,00	0,99	0,92	1,00	1,00	0,99
	2100	1,00	1,00	0,94	1,00	0,99	0,95	1,00	1,00	0,99
19	300	1,00	0,90	0,66	1,00	0,84	0,60	1,00	0,92	0,76
	900	1,00	0,92	0,72	1,00	0,86	0,64	1,00	0,94	0,78
	2100	1,00	0,94	0,76	1,00	0,88	0,69	1,00	0,95	0,81
20	300	0,92	0,66	0,46	0,84	0,44	0,32	0,91	0,62	0,38
	900	0,94	0,70	0,49	0,85	0,49	0,34	0,93	0,66	0,40
	2100	0,95	0,72	0,52	0,86	0,59	0,36	0,94	0,69	0,42
21	300	1,00	0,95	0,70	1,00	0,89	0,65	1,00	0,90	0,74
	900	1,00	0,98	0,72	1,00	0,95	0,69	1,00	0,93	0,77
	2100	1,00	1,00	0,80	1,00	1,00	0,75	1,00	0,96	0,82
22	300	1,00	0,98	0,87	1,00	0,97	0,88	1,00	1,00	0,99
	900	1,00	0,99	0,90	1,00	0,97	0,91	1,00	1,00	0,99
	2100	1,00	1,00	0,93	1,00	0,99	0,95	1,00	1,00	0,99
23	300	1,00	0,95	0,86	0,98	0,96	0,95	1,00	1,00	1,00
	900	1,00	0,95	0,86	0,98	0,96	0,95	1,00	1,00	1,00
	2100	1,00	0,95	0,86	0,98	0,96	0,95	1,00	1,00	1,00

Dependence of ξ on temperature of medium

Element	l	$\xi(T)/\xi(0)$ при T °K, равном						
		300	600	900	1200	1500	1800	2100
Beryllium	20	1,00	0,99	0,99	—	—	—	—
	21	0,99	0,99	0,98	—	—	—	—
	22	0,98	0,97	0,96	—	—	—	—
	23	0,96	0,94	0,91	—	—	—	—
	24	0,91	0,87	0,83	—	—	—	—
	25	0,83	0 73	0,64	—	—	--	—
Graphite	20	1,00	0,99	0,99	0,99	0,99	0,98	0,98
	21	0,99	0,99	0,98	0,98	0,97	0,97	0,96
	22	0,98	0,97	0,96	0,95	0,94	0,93	0,92
	23	0,95	0,93	0,91	0,90	0,87	0,85	0,83
	24	0,88	0,86	0,83	0,78	0,74	0,70	0,66
	25	0,74	0,69	0,62	—	—	—	—
$A > 20$	20	1,00	1,00	1,00	0,99	0,99	0,99	0,99
	21	1,00	0,99	0,99	0,99	0,98	0,98	0,97
	22	0,99	0,98	0,98	0,97	0,96	0,95	0,94
	23	0,98	0,97	0,95	0,93	0,91	0,90	0,88
	24	0,96	0,92	0,89	0,85	0,81	0,77	0,74
	25	0,92	0,84	0,76	0,68	—	—	—

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