MCIC Report/June 1977 MCIC-77-32

AD A042252

(1)

B.S.

THE EFFECT OF RAPID HEATING ON THE PROPERTIES OF MATERIALS

A Bibliography With Descriptors

DDC RECEIVED AUG 1 1977 D

DDC FILE COPY

Metals and Ceramics Information Center
Battelle
Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

ACCESSION for
NTIS White Section ☑
DDC Buff Section ☐
UNANNOUNCED ☐
JUSTIFICATION
BY
DISTRIBUTION/AVAILABILITY CODES
Dist. AVAIL. and/or SPECIAL
A 21

(1)

MCIC Report/June 1977

(6) # THE EFFECT OF RAPID HEATING ON THE PROPERTIES OF MATERIALS

A Bibliography With Descriptors

(10) Compiled by
Dorothea M. Johnson
Battelle's Columbus Laboratories
Columbus, Ohio

(11) Jun 77

(12) 86p.

(14) MCIC-77-32

DDC
RECEIVED
AUG 1 1977
D

METALS AND CERAMICS INFORMATION CENTER
A Department of Defense Information Analysis Center
Columbus, Ohio

Approved for public release; distribution unlimited

407032

ACKNOWLEDGEMENT

This document was prepared by the Metals and Ceramics Information Center (MCIC), Battelle's Columbus Laboratories, 505 King Avenue, Columbus, Ohio 43201. MCIC's objective is to provide a comprehensive current resource of technical information on the development and utilization of advanced metal- or ceramic-base materials.

The Center is operated by Battelle-Columbus under Contract Number DSA900-76-C-2471 for the U.S. Defense Supply Agency; technical aspects of MCIC operations are monitored by the Army Materials and Mechanics Research Center. The support of these sponsor organizations is gratefully acknowledged.

This document was prepared under the sponsorship of the Department of Defense. Neither the United States Government nor any person acting on behalf of the United States Government assumes any liability resulting from the use or publication of the information contained in this document or warrants that such use or publication will be free from privately owned rights.

Approved for public release; distribution unlimited

All rights reserved. This document, or parts thereof, may not be reproduced in any form without written permission of the Metals and Ceramics Information Center.

U.S. DEPARTMENT OF COMMERCE

7-27-77

To : Mr. Muse

From: Jim Apistolas

New IAC report (MCIC). Please input. Thanks.

TRANSMITTAL FORM CD-82A (10-67)
PRESCRIBED BY DAO 214-2

USCOMM-DC 1232-P67
GPO : 1976 O - 216-459

TABLE OF CONTENTS

Page

INTRODUCTION v

DESCRIPTIVE BIBLIOGRAPHY 1

AUTHOR INDEX 53

SUBJECT INDEX 57

- SURFACE EFFECTS 57
- MICROSTRUCTURAL CHANGES 63
- MECHANICAL PROPERTIES 68
- THERMAL PROPERTIES 73
- ELECTRICAL PROPERTIES 77

INTRODUCTION

The effect of severe environments on the properties of structural materials is an area of continuous concern to designers of high-powered engines, high-speed aircraft, reentry vehicles, missiles, rockets, nuclear weapons, lasers, and other military space- and ground-use devices. In such applications, materials may experience conditions beyond their normally recommended temperature ceilings and fracture limits because of unanticipated increases in temperature while under high strain rates. Furthermore, many of the devices have service lives measured in minutes or hours and may be used only once. Such demands upon structural materials present special problems to designers and manufacturers and require a revision in design criteria for structural components.

New data on design-allowable parameters have evolved from numerous studies on the effect of rapid heating on structural materials. A variety of materials have been evaluated in short-time, elevated-temperature tensile tests using one of the following approaches:

- Heat, then load or strain at various rates to failure
- Load, then heat at various rates to a specified temperature--hold until failure occurs
- Load, then heat at various rates until failure occurs.

Experimental studies have also used a variety of heating methods, e.g. (1) electrical resistance and furnace heating, (2) laser heating, and (3) pulsed-electron-beam heating.

The purpose of this document is to provide a ready reference to pertinent literature related to the effects of severe heating environments on the properties of structural materials possibly under consideration for development of military space- and ground-use devices.

SCOPE

Aerospace engineers and designers have shown an interest in the effect of rapid heating on the properties of materials. In response to this interest, a collection of relevant publications has been compiled in this bibliography report. This bibliography, which is annotated by descriptors, contains references to over 350 documents published from 1948 to 1976. The bibliographic citations are arranged in chronological order and in alphabetical order by last names of first authors and by year of publication. A continuous numbering system is used throughout the bibliography, and accession numbers are employed as locators in all of the indexes.

MATERIAL/PROPERTY INDEXES

Combined Material/Property Indexes are provided for the convenience of readers. References relating to the mechanical properties of a material are readily identified and completely separated from the surface effects (damage), microstructural changes (bulk damage), thermal properties, and electrical properties. For example, data for aluminum is retrievable from five separate indexes:

Material (Aluminum)/Surface Effects Index
Material (Aluminum)/Microstructural Changes Index
Material (Aluminum)/Mechanical Properties Index
Material (Aluminum)/Thermal Properties Index
Material (Aluminum)/Electrical Properties Index

PRECEDING PAGE BLANK-NOT FILMED

Readers interested in surface effects, surface damage, optical properties, or physical properties of a given material should utilize the Surface Effects Index. While those interested in phase transformations, bulk damage, or destructive actions should enter the literature collection through the Microstructural Changes Index.

A tabulated summary of material groups and their associated properties is given in Table 1.

In the published literature, different proprietary designations are occasionally applied to the same alloy. For consistency in the indexing of such alloys in the report, a common designation was selected in accordance with accepted international alloy descriptors. Table 2 illustrates some of the reported and indexed designations that were used.

TABLE 1. MATERIAL AND PROPERTY INDEX SUMMARY

Material	Surface Effects[1]	Microstructural Changes[2]	Mechanical Properties	Thermal Properties	Electrical Properties
Alkali Halides	x	x	x	x	
Aluminides	x	x	x		
Aluminum	x	x	x	x	x
Antimonides		x			
Arsenides	x	x	x	x	
Beryllium	x		x		x
Bismuth	x	x			
Borides			x	x	
Boron		x			
Bromides	x	x	x	x	
Cadmium	x				
Calcite	x				
Carbides	x	x	x	x	
Carbon/Graphite	x	x	x	x	
Ceramic Materials	x		x	x	
Chalcogenides	x	x	x	x	
Chlorides	x	x	x	x	
Chromium	x	x			
Cobalt	x	x	x	x	
Composites	x	x	x	x	
Copper	x	x	x	x	x
Dielectric Materials	x	x		x	
Fluorides	x	x	x	x	
Germanium	x	x			x
Glass	x	x	x	x	
Gold	x		x		
Intermetallic Compounds	x	x	x		
Iodides/Iodates	x	x			
Iron	x	x	x	x	x
Lead	x	x		x	
Lithium Niobate	x				
Magnesium	x		x	x	
Mirrors	x				
Molybdenum	x	x	x	x	
Nickel	x	x	x	x	x
Niobium	x	x	x	x	
Nitrides			x	x	
Optical Materials	x		x		
Oxides	x	x	x	x	

TABLE 1. (Continued)

Material	Surface Effects[1]	Microstructural Changes[2]	Mechanical Properties	Thermal Properties	Electrical Properties
Paint	x				
Phosphates	x	x			
Phosphorus		x			
Polymers	x	x	x	x	
Proustite	x				
Quartz	x	x	x	x	x
Refractory Materials	x		x	x	
Semiconductors	x	x	x	x	
Silicates	x				
Silicon	x	x	x		x
Silver	x			x	
Steel-Engineering	x	x	x	x	x
Steel-Maraging		x	x		
Steel-Stainless	x	x	x	x	x
Strontium Titanate	x				
Sulfides	x	x	x	x	
Tantalum	x	x	x	x	
Tin	x	x		x	
Titanium	x	x	x	x	
Tungsten	x	x		x	
Vanadium				x	
Water Coatings	x				
Yttrium Orthovanadate	x				
Zinc	x	x		x	
Zirconium	x				

(1) Surface effects, surface damage, optical properties, physical properties.
(2) Microstructural changes, phase transformation, bulk damage, destruction.

TABLE 2. EQUIVALENT DESIGNATIONS FOR INDEXED MATERIALS

Reported Designations	Indexed Designations
Aluminum	
14S	2014
24S	2024
61S	6061
75S	7075
78S	7078
Cobalt	
Stellite 25	L-605
Nickel	
A-Nickel	Nickel 200
Inconel	Inconel 600
Titanium	
RC-70A	Unalloyed Titanium
B120VCA	Ti-13V-11Cr-3Al
C110M	Ti-5.8Mn
A110AT	Ti-5Al-2.5Sn
140A	Ti-1.8Cr-1.5Mo-1.8Fe (Ti-2Cr-2Mo-2Fe)
RC-130A	Ti-7.8Mn
RS-120	Ti-6Al-4V
Others	
Calcium Carbonate	Calcite
Silver Arsenite	Proustite
Sapphire	Oxides
Ruby	Oxides

DESCRIPTIVE BIBLIOGRAPHY

1948

1. Cross, H. C., McMaster, R. C., et al., "Short-Time, High Temperature Properties of Heat-Resisting Alloy Sheet", Technical Report RA-15077, Battelle Memorial Institute (February 27, 1948).

   Stainless steel; 18/8 stainless; AISI 347; 19-9 DL; 25Cr-20Ni-2Si; engineering steel; AISI 4130; nickel alloys; Inconel 600; Hastelloy C; cobalt alloys; HS21; rapid heating; short time; elevated temperature; ultimate tensile strength; tensile yield strength; elongation; modulus of elasticity; stress-strain data; thermal expansion; deformation

1949

2. Simmons, W. F., Van Echo, J. A., et al., "Short-Time, High-Temperature Properties of Heat-Resisting Alloy Sheet", Technical Report R-147, Battelle Memorial Institute (June 1949).

   Magnesium alloys; Mg-3Al-1Zn; Mg-1Mn; aluminum; aluminum alloys; 7075; Armco Iron; engineering steel; AISI 4130; stainless steel; 18/8 stainless; AISI 347; 25Cr-20Ni-2Si; nickel alloys; Inconel 600; Inconel X-750; Hastelloy B; Hastelloy C; cobalt alloys; HS21; short time; elevated temperature; rapid heating; stress; deformation; elongation; creep rupture strength; ultimate tensile strength; tensile yield strength; thermal expansion

1951

3. Van Echo, J. A., Page, L. C., et al., "Short-Time Creep Properties of Structural Sheet Materials for Aircraft", Air Force Technical Report 6731 - Part I, Battelle Memorial Institute, Contract AF 33(038)-8743 (December 1951).

   Magnesium alloys; aluminum alloys; 2024-T3; 2024-T86; 7075-T6; engineering steel; AISI 1010; cobalt alloys; L-605; rapid heating; short time; elevated temperature; tensile properties; creep properties; deformation

1952

4. Smith, W. K., Woolsey, C. C., Jr., and Wetmore, W. O., "Effect of High Heating Rates on High-Temperature Properties", Transactions of the American Society for Metals, 44, 689-704 (1952).

   Engineering steel; AISI 1020; AISI 4130; aluminum alloys; 2014-T6; 2024-T4; 7075-T6; rapid heating; short time; elevated temperature; tensile properties; elongation; tensile yield strength; ultimate tensile strength; stress-strain data

1954

5. Feuerstein, W. J., and Smith, W. K., "Elevation of Critical Temperatures in Steel by High Heating Rates", Transactions of the American Society for Metals, 46, 1270-1284 (1954).

   Engineering steel; AISI 1020; AISI 1042; AISI 1080; AISI 4130; rapid heating; short time; elevated temperature; tensile properties; elongation; plastic deformation

6. Van Echo, J. A., Wirth, W. F., et al., "Short-Time Creep Properties of Structural Sheet Materials for Aircraft", WADC Technical Report 6731 - Part III, Battelle Memorial Institute, Contract AF 33(038)-8743 (October 1954).

   Titanium alloys; Ti-8Mn; aluminum alloys; 78S-T6; 24S-T81; 14S-T6; engineering steel; AISI 8630; AISI 4340; stainless steel; AISI 321; 17-7PH; iron alloys; Fe-3Cr-1Mo; rapid heating; short time; elevated temperature; creep test; tensile properties

1955

7. Dotson, C. L., and Kattus, J. R., "Tensile Properties of Aircraft Structural Metals at Various Rates of Loading After Rapid Heating", WADC Technical Report 55-199, Part I, Southern Research Institute, Contract AF 33(616)-424 (August 1955). (AD 090 524)

   Stainless steel; AISI 321; aluminum alloys; 2014-T6; 2024-T3; 7075-T6; magnesium alloys; AZ31; titanium alloys; Ti-8Mn; titanium; rapid heating; short time; elevated temperature; stress-strain data; ultimate tensile strength; tensile yield strength; elongation; modulus of elasticity

8. Heimerl, G. J., and Inge, J. E., "Tensile Properties of 7075-T6 and 2024-T3 Aluminum-Alloy Sheet Heated at Uniform Temperature Rates Under Constant Load", National Advisory Committee for Aeronautics Technical Note NACA TN 3462 (July 1955).

   Aluminum alloys; 7075-T6; 2024-T3; rapid heating; short time; elevated temperature; stress-strain data; ultimate tensile strength; tensile yield strength; elongation; modulus of elasticity; fracture; thermal expansion

9. Heimerl, G. J., and Inge, J. E., "Tensile Properties of Some Sheet Materials Under Rapid-Heating Conditions", National Advisory Committee for Aeronautics, NACA RM L55E12b (June 9, 1955).

   Aluminum alloys; 2024-T3; 7075-T6; nickel alloys; Inconel 600; titanium alloys; Ti-6Al-4V; rapid heating; short time; elevated temperature; stress-strain data; tensile yield strength

10. Van Echo, J. A., Gullotti, D. V., et al., "Short-Time Creep Properties of Structural Sheet Materials for Aircraft and Missiles", Technical Report 6731, Part 4, Battelle Memorial Institute, Contract AF 33(038)-8743 (July 1955).

    Stainless steel; 17-7PH; AISI 410; A-286; engineering steel; AISI 4130; titanium alloys; Ti-7.8Mn; aluminum alloys; 6061-T6; 7075-T6; short time; rapid heating; creep test; elongation; grain size; precipitation; recrystallization; ultimate tensile strength; tensile yield strength; deformation; thermal expansion

1956

11. Morrison, J. D., and Kattus, J. R., "Tensile Properties of Aircraft-Structural Metals at Various Rates of Loading After Rapid Heating", WADC Technical Report 55-199, Part 2, Southern Research Institute, Contract AF 33(616)-424 (November 1956). (AD 110 540)

    Cobalt alloys; L-605; engineering steel; AISI 1020; AISI 4130; nickel alloys; Inconel X-750; stainless steel; AISI 301; 17-7PH; titanium alloys; Ti-5Al-2Sn; Ti-2Cr-2Mo-2Fe; magnesium alloys; ZH62; aluminum alloys; 356-T6; rapid heating; short time; elevated temperature; strain rate; ultimate tensile strength; tensile yield strength; elongation; modulus of elasticity.

1957

12. Kattus, J. R., "Structural Materials for Missile Applications at Very High Temperatures", Jet Propulsion, 27 (6), 644-649 (June 1957).

    Copper; iron; molybdenum; tantalum; graphite; rapid heating; short time; elevated temperature; stress-strain data; tensile properties; modulus of elasticity; creep deformation; creep rupture strength

1958

13. Abrams, L. A., "Ultra-Short-Time Creep Rupture", Scientific Report No. 3, American Machine & Foundry Company, Contract AF 33(616)-5557 (December 15, 1958).

    Stainless steel; AISI 410; rapid heating; short time; elevated temperature; ultimate tensile strength; tensile yield strength; elongation; modulus of elasticity

14. Mollica, R. J., "Very-Short-Time High Temperature Properties of Magnesium Alloy HM21XA and Titanium Alloy 6Al-4V. Revision 1", Technical Memorandum MT-M50J, Chrysler Corporation, Contract CWO 270286 and CWO 200120 (April 3, 1958).

    Magnesium alloys; HM21XA; titanium alloys; Ti-6Al-4V; short time; rapid heating; elevated temperature; stress-strain data; ultimate tensile strength; tensile yield strength; modulus of elasticity; thermal expansion

15. Preston, J. B., Roe, W. P., and Kattus, J. B., "Determination of the Mechanical Properties of Aircraft-Structural Materials at Very High Temperatures After Rapid Heating", WADC TR 57-649, Part I, Southern Research Institute, Contract AF 33(616)-3494 (Janaury 1958). (AD 142 284)

    Electrolytic tough pitch copper; OFHC copper; nickel 200; iron; molybdenum; tantalum; graphite; AISI 316; rapid heating; elevated temperature; tensile properties; creep properties; fracture properties; compressive properties; shear properties; bend properties

1959

16. Bernett, E. C., "Short Time, Elevated Temperature, Stress-Strain Behavior of Tensile, Compressive, and Column Members", Technical Report 5786, The Marquardt Corporation, Contract AF 33(616)-6043 (October 15, 1959).

    Aluminum alloys; 2024-T81; stainless steel; 17-7PH; iron alloys; N-155; titanium alloys; Ti-6Al-4V; short time; rapid heating; elevated temperature; stress-stain data; ultimate tensile strength; compressive strength; creep properties

17. Clapper, R. B., "Isochronous Stress-Strain Curves for Some Magnesium Alloys Showing the Effects of Varying Exposure Times on Their Creep Resistance", Proceedings of the American Society for Testing Materials, 58, 812-825 (1959).

    Magnesium alloys; HK31A-H24; HM21A-T8; HM31XA; rapid heating; short time; elevated temperature; stress-strain data; tensile creep; creep properties; tensile properties

18. Dedman, H., Wheelahan, E. J., et al., "Short-Time Elevated-Temperature Mechanical Properties of Metals Under Various Conditions of Heat Treatment, Heating, Exposure Time, and Loading", Summary Report 4098-811-X, Southern Research Institute, Contract DA-01-009-ORD-494 (July 17, 1959).

    Molybdenum alloys; nickel alloys; waspalloy; iron alloys; N-155; engineering steel; stainless steel; A-286; AISI 301; titanium alloys; Ti-13V-11Cr-3Al; Ti-6Al-4V; Ti-1Al-8V-5Fe; Ti-8Al-2Cb-1Mo; rapid heating; short-time data; elevated temperature; tensile properties

19. Gronvold, W., "Aluminum and Magnesium Casting Development Program Summary", Technical Report D5-4442, The Boeing Company (April 24, 1959).

    Casting alloys; aluminum alloys; A356-T6; C355-T6; Tens 50; magnesium alloys; AZ91C-T6; ZK51A-T6; ZH62A-T5; HK31A-T6; rapid heating; short time; elevated temperature; tensile properties

20. Kattus, J. B., "Tensile Properties of Aircraft-Structural Metals at Various Rates of Loading After Rapid Heating", WADC TR 58-440, Part II, Southern Research Institute, Contract AF 33(616)-3996 (February 1959).

    Aluminum alloys; 2024-T3; 7075-T6; 2014-T6; 356-T6; titanium alloys; Ti-8.5Mn; Ti-5Al-2Sn; Ti-2Mo-2Cr-2Fe; Ti-6Al-4V; magnesium alloys; AZ31; ZH62-T5; stainless steel; AISI 321; AISI 301; 17-7PH; AM350; engineering steel; AISI 4130, AISI 1020; cobalt alloys; Stellite 25; nickel alloys; Inconel X-750; rapid heating; short time; elevated temperature; tensile properties; modulus of elasticity; strain rate

21. Korchynsky, M., "Creep-Rupture Properties of Alloys Near the Melting Temperature", Technical Report, Union Carbide Corporation, Contract DA-30-069-ORD-2409 (May 28, 1959).

    Stainless steel; AISI 304; AISI 446; A-286; engineering steel; AISI 4130; iron alloys; N-155; nickel alloys; Hastelloy B; Hastelloy C; Hastelloy R; Rene 41; Inconel 702; cobalt alloys; L-605; creep rupture strength; elevated temperature; short time; creep rate; elongation

1960

22. Barnett, C.W.H., "Ultra-Short-Time Creep Rupture", WADC Technical Report 59-762, Part 3, American Machine & Foundry Company, Contract AF 33(616)-6798 (August 1960).

    Magnesium alloys; HM21; engineering steel; H-11; stainless steel; AISI 310; short time; elevated temperature; creep test; strain rate; stress-strain data

23. Fenn, R. W., Jr., "Compression Testing of Sheet Magnesium Utilizing Rapid Heating", Proceedings of the American Society for Testing Materials, 60, 940-956 (1960).

    Magnesium alloys; HK31A-H24; rapid heating; short time; elevated temperature; strain rate; tensile creep; tensile yield strength; ultimate tensile strength; compressive yield strength; elongation; stress-strain data

24. Ives, J. S., Jr., "Ultra-Short-Time Creep Rupture", WADC Technical Report 59-762, Part 2, American Machine & Foundry Company, Contract AF 33(616)-5557 (May 1960).

    Stainless steel; AISI 321; AISI 410; AM350; PH15-7Mo; nickel alloys; Inconel X-750; Rene 41; Udimet 500; titanium alloys; Ti-13V-11Cr-3Al; short time; elevated temperature; creep test; strain rate; thermal expansion; stress-strain data

25. Kattus, J. R., and McDowell, D. W., Jr., "Strength of Structural Alloys Under Rapid Heating and Loading", Proceedings of the American Society for Testing Materials, 60, 928-939 (1960).

    Stainless steel; AISI 301; AISI 304; PH15-7Mo; nickel alloys; Rene 41; Inconel X-750; Nimonic 90; rapid heating; short time; elevated temperature; creep properties; strain rate; tensile yield strength; elongation

26. Levitt, A. P., and Martin, A. G., "Application of Induction Heating to Short-Time Elevated-Temperature Tension Testing", Proceedings of the American Society for Testing Materials, 60, 974-985 (1960).

    Titanium alloys; rapid heating; short time; elevated temperature; ultimate tensile strength; tensile yield strength; elongation; techniques; apparatus

27. Preston, J. B., and Kattus, J. R., "Determination of the Mechanical Properties of Aircraft-Structural Materials at Very High Temperatures After Rapid Heating", WADC TR 57-649, Part II, Southern Research Institute, Contract AF 33(616)-3494 (April 1960).

    Beryllium; copper; nickel 200; molybdenum; graphite; stainless steel; 17-7PH; coatings; rapid heating; elevated temperature; tensile properties

28. Willhelm, A. C., and Kattus, J. R., "Determination of the Mechanical Properties of Aircraft-Structural Materials at Very High Temperatures After Rapid Heating. Part 3: The Effect of Simultaneous Heating and Loading on the Tensile Properties of Typical Structural Alloys", WADC Technical Report 57-649, AF 33(616)-3494 (November 1960).

Stainless steel; 17-7PH; AISI 301; nickel alloys; Inconel X-750; rapid heating; short time; elevated temperature; stress-strain data; strain rate; tensile properties

1962

29. Knight, J. P., Cosby, W. A., et al., "Ultra-Short-Time Creep Rupture", WADC-TR-59-762, Part 4, American Machine & Foundry Company, Contract AF 33(616)-7632 (August 1962).

Tantalum alloys; Ta-10W; rapid heating; short time; elevated temperature; techniques; apparatus; stress-strain data; thermal expansion; strain rate; tensile properties

1963

30. Bendix Corporation, "Investigation of Aerospace Vehicle Vulnerability to Coherent Radiation", Technical Documentary Report ASD-TDR-63-600, Contract AF 33(657)-9505 (July 1963). (AD 338 735)

Lead sulfide; indium arsenide; germanium; chromium coatings; glass substrates; aluminum coatings; Mylar substrates; aluminum; magnesium; Plexiglass; Lucite; Teflon; epoxy resin; laser effect; laser damage; pitting; damage threshold; penetration depth; weight change; surface roughness

31. Steinberg, G. N., "Research into the Causes of Laser Damage to Optical Components", Second Quarterly Report, PE-TR-7803, Perkin-Elmer Corporation, Contract DA-28-043-AMC-00009 (August 13, 1963).

Dielectric coatings; glass; optical materials; laser damage; damage thresholds; surface studies

1964

32. Doering, H., and Shahinian, P., "Effect of Electron Bombardment Heating on Surfaces of Tungsten", NRL Report 6119, Naval Research Laboratory (July 22, 1964). (AD 604 170)

Tungsten; rapid heating; electron beam heating; short time; elevated temperature; surface studies; penetration depth; pitting; grooving; cracking; grain boundaries; plastic deformation

33. Frisch, J., and Arne, C. L., "Optical Strain Determination at Transient High Temperatures in Stainless Steel", Experimental Mechanics, 4, 320-327 (November 1964).

Stainless steel; AISI 304; rapid heating; heat flux; short time; elevated temperature; stress distribution; thermal expansion; measurement

34. Myers, J. D., Power Density Effects in Laser Produced Craters, Proceedings of the Electron Beam Symposium, Sixth Annual Meeting, Edited by J. R. Morley (1964), pp 186-205.

Stainless steel; AISI 302; titanium; OFHC copper; cobalt alloys; HS21; laser effect; cratering

1965

35. Aver'yanova, T. M., Mirkin, L. I., Pilipetskii, N. F., and Rustamov, A. R., "The Action of Intense Light Beams on Metal Surfaces", Journal of Applied Mechanics and Technical Physics, (6), 54-57 (November/December 1965).

Armco iron; engineering steel; lead; Duralumin; tin; laser machining; laser damage; microhardness; cratering; microstructure

36. Brodin, M. S., Vatulev, V. N., and Zakrevskiy, S. V., "The Effect of an Intensive Laser Radiation on the Dispersion Properties of Transparent Crystals", Zhurnal Eksperimentalnoy i Teoreticheskoy Fiziki, Pisma v Redaktsiyu, 2 (7), 317 (1965).

Semiconductor materials; cadmium sulfide; zinc sulfide; laser effect; reflectivity; absorption; refractive index

37. Steinberg, G. N., "Research into the Causes of Laser Damage to Optical Components", Final Report, PE-TR-7945, Perkin-Elmer Corporation, Contract DA-28-043-AMC-00009 (February 1965). (AD 475 527)

Mirrors; dielectric coatings; thorium oxyfluoride coatings; magnesium fluoride coatings; zinc sulfide coatings; ruby substrates; quartz substrates; glass substrates; laser damage; damage thresholds; failure; absorption; residual stresses

38. Vogel, K., and Backlund, P., "Application of Electron and Optical Microscopy in Studying Laser-Irradiated Metal Surfaces", Journal of Applied Physics, 36 (12), 3697-3701 (December 1965).

Silver; aluminum; beryllium; copper; lead; engineering steel; carbon steel; laser effect; laser damage; microcratering; metallography; melting; thermal stress

1966

39. Gregg, D. W., and Thomas, S. J., "Momentum Transfer Produced by Focused Laser Giant Pulses", Journal of Applied Physics, 37 (7), 2787-2789 (June 1966).

Beryllium; carbon; aluminum; zinc; silver; tungsten; laser effect; shock waves; pressures; spalling; burn-through data

40. Mirkin, L. I., "Hardening of Steels Under the Effect of a Laser Beam", Metallovedeniye i Termicheskaya Obrabotka Metallov, (4), 70-72 (1966).

Engineering steel; laser effect; hardening; surface studies

41. Murphy, J., and Ritter, G. J., "Laser-Induced Damage in Copper Crystals", Applied Physics Letters, 9 (7), 272-273 (October 1, 1966).

Copper; single crystals; laser damage; cratering; defects; dislocations; plastic deformation; hardness

42. Rudenko, V. N., Bragisnkiy, V. B., and Minakova, S. I., "Temperature Variation in a Matter Under Influence of Laser Pulses", Optika i Spektroskopiya, 20 (2), 370 (1966).

Silver coatings; copper substrates; laser effect; vaporization; thermal properties; surface studies

43. Sessler, J., and Weiss, V., "Materials Data Handbook--Aluminum Alloy 7075", Syracuse University Research Institute, Syracuse, New York, Contract NASA-11345 (August 1966).

Aluminum alloys; 7075; space environment effects; radiation effects; sputtering; erosion resistance; cratering; penetration depth

1967

44. Anisimov, S. I., Bonch-Bruevich, A. M., et al., "Effect of Powerful Light Fluxes on Metals", Soviet Physics - Technical Physics, 11 (7), 945-952 (January 1967).

Magnesium; brass; Duralumin; tin; engineering steel; copper; graphite; laser effect; holes; evaporation; cratering; melting; destructive testing; erosion

45. Babcock, S. G., Kumar, A., and Green, S. J., "Response of Materials to Suddenly Applied Stress Loads. *Part I: High Strain-Rate Properties of Eleven Reentry-Vehicle Materials at Elevated* Temperatures", Technical Report AFFDL-TR-67-35, Part I, General Motors Corporation, Contract DA-49-146-XZ-322 (April 1967). (AD 813 880)

Aluminum alloys; 6061-T6; 7075-T6; titanium alloys; Ti-6Al-4V; beryllium alloys; I-400; silica phenolic; carbon phenolic; quartz phenolic; graphite; Micarta; *Plexiglass (polymethylmethacrylate); fused silica; short time; strain* rate; stress-strain data; elevated temperature; compression test; flow properties; deformation; fracture; density; weight change

46. Barenblatt, G. I., Vsevolodov, N. N., Mirkin, L. I., et al., "Destruction of Transparent Materials by Laser Radiation. Formation of Gas Bubbles and Wedging of the Material by Gas Pressure", Soviet Physics JETP Letters, 5 (3), 69-71 (February 1, 1967).

Polymers; polymethylmetacrylate; polystyrene; laser damage; destructive testing; crack propagation; surface studies; modulus of elasticity; Poisson's ratio

47. Belyanin, V. A., Zhukov, A. A., Kokora, A. N., and Tusheva, A. A., "Structure and Hardness of Surface Layers of Steel After Treatment With Laser Rays", Fizika i Khimiya Obrabotki Materialov, (2), 115-116 (1967).

Carbon steel; engineering steel; laser machining; cutting; microstructure; surface studies; microhardness; hardness

48. Mirkin, L. I., and Pilpetskii, N. F., "Physical Nature of the Hardening of Steels Under the Influence of Light Pulses", Soviet Physics - Doklady, 12 (1), 89-91 (July 1967).

Engineering steel; carbon steel; laser effect; physical properties; hardening; microstructure; martensite; hardness; penetration depth; cratering; distortion; density

49. Novikov, N. P., Andrianova, G. P., and Vsevolodov, N. N., "Action of a Powerful Light Pulse on Polypropylene Films and Blocks", Vysokomolekulyarnye Soyedineniya, Seriya A, 9 (12), 2656-2658 (December 1967).

Polymers; polypropylene; laser effect; microstructure

50. Schilberg, L. E., "Tensile and Shear Strengths of Several Reinforced Plastics Undergoing Rapid Heating", NWC TP 4447, Naval Weapons Center (November 1967). (AD 826 040)

Plastics; rapid heating; ultimate tensile strength; shear ultimate strength

51. Vladimirov, V. I., Likhachev, V. A., et al., "Statistical Relationships Governing the Formation of Cracks in Polymethylmethacrylate Under the Action of Laser Radiation", Soviet Physics - Solid State, 9, 411-416 (August 1967).

Polymers; polymethylmethacrylate; laser effect; surface studies; cracking

52. Volkova, N. V., Likhachev, V. A., et al., "Fracture of LiF Single Crystals Under the Action of Laser Radiation", Soviet Physics - Solid State, 8, 2133-2135 (March 1967).

Lithium fluoride; single crystals; laser effect; surface studies; fracture

1968

53. "Destruction Structure of a Metallic Surface by a Concentrated Laser Beam", Vzaimodeistive Materialy Vysoko Temperaturnyye Naznacheniya Sredoi Sbornik Trudav Vsesoyuznyy Nauchnykh Seminara 1967, 127-136 (1968).

Tantalum; molybdenum; copper; nickel; cadmium; laser effect; surface studies; absorption; microhardness; metallography; microstructure

54. Babcock, S. G., and Perkins, R. D., "High Strain-Rate Response of Three Heat-Shield Materials at Elevated Temperatures"; Volume II, Final Report SAMSO TR-68-71, General Motors Corporation, Contract F04694-67-C-0033 (January 1968). (AD 842 604)

Quartz; silica; carbon phenolic; elevated temperature; strain rate; short time; rapid heating; compression test; fracture; stiffness; compression properties; cracks

55. Glikman, L. A., Krylov, K. I., and Rubashkina, Z. M., "The Effect of a Laser Beam on Steel", Referatirnyy Zhurnal Radiotekhnika Abstract 1D390, (1), D052 (1968).

Engineering steel; laser effect; metallurgy; hardness; microhardness

56. Jerusalimskaya, A. N., Samoylov, V. I., and Ulyakov, P. I., "Structural Changes in a Substance Under the Action of Light Laser Pulses", Fizika i Khimiya Obrabotki Materialov, (4), 26-34 (1968). (In Russian)

Aluminum alloys; engineering steel; iron; copper; lead; titanium; zinc; niobium; molybdenum; tungsten; laser effect; metallography; microstructure

57. Kaporsky, L. N., Kokora, A. N., Romanenkova, G. A., et al., "Effect of a Pulse From a Laser With a Modulated Q Factor on Steel", Fizika i Khimiya Obrabotki Materialov, (1), 3-10 (January-February 1968).

Engineering steel; laser effect; metallography; microstructure; grain boundaries; microhardness

58. Kidin, I. N., and Doronin, I. V., "Short Time High Temperature Strength of KhN77TYu", Izvestiya VUZ, Chernaya Metallurgiya, (9), 153-155 (1968).

Russian alloys; nickel alloys; KhN77TYu; rapid heating; short time; elevated temperature; ultimate tensile strength

59. Pedanov, V. V., Chepizhnyi, K. I., and Deev, V. N., "Effect of Powerful Laser Beam on Certain Types of Glasses and Crystalline Quartz", Steklo, (3), 24-28 (1968).

Glass; quartz; laser effect; surface studies; cracking; fracture; destructive test; time

60. Rikman, E. P., Kokorova, A. N., and Zhukov, A. A., "Distribution of Alloying Elements in Stainless Steel in the Affected Zone of Focused Laser-Irradiation", Sbornik Voprosy Metallovedeniye i Prochnosti Metallov i Splavov, Tula, 182-185 (1968).

Stainless steel; 1Kh18N9T; laser effect; spectral analysis; particle distribution; interlayers; holes; microstructure

61. Tang, C. L., "Stimulated Brillouin Scattering and Laser Damage of Optical Materials", Final Report (Part I), AFCRL-68-0598, Cornell University Contract AF 19(628)-5677 (October 30, 1968). (AD 681 124)

Optical materials; glass; quartz; laser materials; laser damage; damage threshold; thermal stress; creep rupture strength; electric breakdown

62. Veiko, V. P., Imas, Ya. A., Kokora, A. N., et al., "Metal Temperature in Interaction Region With a Laser Beam", Soviet Physics - Technical Physics, 12 (10), 1410-1412 (April 1968).

Iron alloys; engineering steel; carbon steel; laser effect; surface removal; surface studies

63. Yefimenko, Yu. M., Kuslitskiy, A. B., Tkachev, V. I., et al., "Effect of Electron Beam Melting on the Strength, Ductility, and Fatigue Life of High-Strength Structural Steel", Fizika i Khimiya Obrabotki Materialov, (1), 91-95 (January 1968).

Engineering steel; VKS-1; Russian alloys; electron beam heating; melting; ultimate tensile strength; ductility; fatigue properties

1969

64. Akimov, A. I., and Mirkin, L. I., "Certain Regularities in the Effect of Laser Beams on Pure Metals", Soviet Physics-Doklady, 13 (11), 1162-1164 (May 1969).

Aluminum; copper; tungsten; molybdenum; tantalum; laser effect; holes; cratering; metallography; grain size; crystal lattice; hardness; thermophysical properties

65. Ashton, R. F., and Thompson, D. S., "Effect of Heating Rate on the Aging Behavior of 7075 Alloy", Transactions of the Metallurgical Society AIME, 245, 2101-2102 (September 1969).

Aluminum alloys; 7075; rapid heating; aging; microstructure; mechanical properties

66. Axelrad, D. R., "Application of the Laser-Beam Technique in Thermal-Shock Testing", Experimental Mechanics, 9 (11), 507-512 (November 1969).

Aluminum; copper; carbon steel; laser effect; thermal shock; thermal properties

67. Barchukov, A. I., and Mirkin, L. I., "Phase Transformations in Steels Under the Influence of a Continuous Laser Beam", Fizika i Khimiya Obrabotki Materialov, (6), 126-129 (1969).

Carbon steel; engineering steel; laser effect; metallography; X-ray diffraction; phase transformations; hardness; grain growth

68. Basharov, R., Ermatov, S. E., et al., "Effects of Laser Irradiation on Structural Changes in Molybdenum Monocrystals", Voprosy Obshchei i Prikladnol Fiziki, 28-30 (1969).

Molybdenum; single crystals; laser damage; metallography; surface studies; deformation; cracks; microstructure

69. Engquist, R. D., "Effects of Lasers on Fracture of Materials", Fracture, Edited by H. Liebowitz, Academic Press, New York (1969), pp 399-424.

Engineering steel; aluminum; copper; iron; laser effect; fracture mechanics; brittleness; surface studies; vaporization; holes; melting; cavitation; microstructure; cracking; shrinkage; grain growth

70. Grasyuk, A. Z., and Zubarev, I. G., "Interaction of Semiconductors With Intense Light Fluxes", Soviet Physics - Semiconductors, 3 (5), 576-579 (November 1969).

Semiconductors; gallium arsenide; silicon; cadmium selenide; laser effect; thermal shock; damage threshold; penetration depth; surface studies; cracking

71. Honeycutt, J. H., "Rapid Heating and Loading of 5052-H34 Aluminum Alloy Sheet", Technical Report RS-TR-69-2, Redstone Arsenal (March 1969).

Aluminum alloys; 5052-H34; rapid heating; short time; elevated temperature; strain rate; ultimate tensile strength; tensile yield strength; elongation; modulus of elasticity; fracture; stress-strain data

72. Kazakevich, V. I., Babikova, Yu. F., et al., "The Problem of the Diffusion Behavior of Impurities in Silicon Under the Influence of Thermogradient Heating", V Sbornik Diffuziya v Poluprovodnikakh, Gor'kiy 1967, (5), 217-225 (1969).

Semiconductor materials; silicon; nickel addition; phosphorous addition; boron addition; laser effect; infrared heating; diffusion; metallography; microstructure

73. Lumley, R. M., "Controlled Separation of Brittle Materials Using a Laser", American Ceramic Society Bulletin, 48 (9), 850-854 (September 1969).

Silicon; aluminum oxide; glass; laser effect; fracture mechanics

74. Panteleev, V. V., and Yankovskii, A. A., "Causes of the Effect of the Physical Properties of Samples on the Entrance of a Substance During Spectral Analysis of Alloys Using Lasers", Spektroskopiya Trudy Sibirskiy Soveshcheniya 4th 1965, 401-403 (1969).

Copper alloys; aluminum alloys; nickel alloys; zinc alloys; iron alloys; tungsten alloys; carbon alloys; tin alloys; lead alloys; laser effect; heating; melting; evaporation; reflectivity; physical properties

1970

75. "Effect of the Structure of Steel on the Formation of Pits by the Action of a Laser Beam", Izvestiya VUZ, Chernaya Metallurgiya, 13 (2), 102-107 (1970).

Stainless steel; Russian alloys; laser effect; pitting; surface studies; metallography; austenite; microstructure; hardness

76. Agranat, M. B., Novikov, N. P., et al., "Visible Crack Centers Produced Under Laser Irradiation", Soviet Physics - Solid State, 12 (3), 718-720 (September 1970).

Polymers; polymethylmethacrylate; polystyrene; laser effect; cracking; crack propagation; ultimate tensile strength

77. Babcock, S. G., et al., "Subsequent Yield and High Heating Rate Properties of Two Aluminum Alloys", Report MSL-70-24, General Motors Corp., Warren, Michigan, Contract 53-0204 for Sandia Corporation (September 1970).

Aluminum alloys; 2024-T3; 6061-T6; rapid heating; short time; elevated temperature; strain rate; techniques; apparatus; tensile properties; ultimate tensile strength; tensile yield strength; elongation

78. Babcock, S. G., and Hockstein, P. A., "High-Strain-Rate Testing of Rapidly Heated Conductive Materials to 7000 F", Experimental Mechanics, 10 (2), 78-83 (February 1970).

Graphite; rapid heating; short time; elevated temperature; strain rate; tensile properties; ultimate tensile strength; measurement; techniques; apparatus

79. Babcock, S. G., Hochstein, P. A., and Jacobs, L. J., "Material Response Studies (Mars II). Volume II. High Heating Rate Response of Two Materials From 72 F to 6000 F", Final Report MSL-69-48-Vol-2, SAMSO TR-69-393-Vol-2, General Motors Technical Center, Contract F04701-68-C-0161 (March 1970). (AD 867 427L)

Graphite composites; carbon composites; resin matrix composites; heating rate; stress-strain data; thermal stress; 6000 F

80. The Boeing Company Aerospace Group, "Interaction Study; Vol. IV, Task 4: Structural Degradation by Short Time Heating", AFWL TR 70-157, Vol. 4, Air Force Contract AFSWC F 29601-70-C-0064, Air Force Weapons Laboratory, Air Force Systems Command, Kirtland AFB, New Mexico (December 1970). (AD 878 558L)

Aluminum alloys; 2024-T81; titanium alloys; Ti-6Al-4V; stainless steel; AISI 301; silicon carbide coatings; laser effect; heating; density; specific heat; thermal conductivity; tensile properties; ultimate tensile strength; creep rupture strength; degradation

81. Bonch-Bruevich, A. M., Imas, Ya. A., et al., "Destruction Threshold of Thin Metal Layers by Laser Emission", Soviet Physics - Technical Physics, 15 (3), 512-513 (September 1970). Translation of Zhurnal Tekhnicheskoi Fiziki, 40, 658-659 (March 1970).

Aluminum coatings; thin films; glass substrates; laser damage; damage threshold; destructive testing; reflectivity

82. Brammer, J. A., and Percival, C. M., "Elevated-Temperature Elastic Moduli of 2024 Aluminum Obtained by a Laser-Pulse Technique", Experimental Mechanics, 10 (6), 245-250 (June 1970).

Aluminum alloys; 2024; rods; laser effect; modulus of elasticity; measurement; single crystals; polycrystalline; 500 C; temperature effect; thermal shock; wave propagation

83. Danileiko, Yu. K., Manenkov, A. A., Prokhorov, A. M., et al., "Surface Damage of Ruby Crystals by Laser Radiation", Soviet Physics JETP, 31 (1), 18-21 (July 1970).

Ruby; aluminum oxide; laser damage; thermal shock; surface studies; destructive tests

84. Davydov, V. G., Shcheglova, N. M., Klochkov, V. I., et al., "Effect of Rapid Heating and Cooling During Quenching, on the Properties of Intermediate Products From Aluminum Alloys", Tekhnologiya Legkikh Splavov, Nauchnykh Tekhnicheskilch Byulleten' Vsesoyuznyy Institut Legkikh Splavov, (5), 133-134 (1970).

Russian alloys; aluminum alloys; D1; D16; rapid heating; mechanical properties

85. Deming, F. L., Weber, J. H., and Tao, L. C., "Ignition of Exothermic Solid-Phase Reactions by a Laser Pulse", Combust Flame, 14 (3), 375-380 (June 1970).

Titanium powder; powder metallurgy; titanium oxide; laser effect; ignition; combustion

86. Eremchenko, D. V., and Morozov, B. N., "Thermoelastic Stresses Set Up in a Transparent Dielectric by Unfocused Laser Radiation", Soviet Physics - Solid State, 12 (3), 655-657 (September 1970).

Dielectric materials; quartz; glass; laser effect; thermal properties; thermoelasticity; absorption; destructive testing

87. Ermatov, S. E., Turdybekov, T. I., and Orozbaev, R. O., "Change in the Microhardness of Molybdenum Single Crystals Under the Effect of Laser Radiation", Vliyanie Primesei Defektov Svoistva Kristallografiya, 32-37 (1970).

Molybdenum; single crystals; laser effect; mechanical properties; surface studies; cracks; deformation; microhardness

88. Fabelinskii, I. L., Kyzylasov, I. I., and Starunov, V. S., "Stimulated Mandel'shtam-Brillouin Scattering and Fracture of Glasses by a Ruby Laser Giant Pulse", Fizika Tverdogo Tela, 12, 233-239 (1970).

Quartz; silica glass; laser damage; fracture toughness

89. Fedotov, S. G., and Konstantinov, K. M., "Effect of Heating Rate on Decomposition of Titanium-Vanadium Martensite", Soviet Physics - Doklady, 15 (4), 410-413 (October 1970).

Titanium alloys; Ti-10V; rapid heating; modulus of elasticity; martensite; decomposition; phase transformation

90. Fersman, I. A., and Khazov, L. D., "Damage of Transparent Dielectric Surfaces by a Laser Beam", Soviet Physics - Technical Physics, 15 (5), 834-838 (November 1970).

Dielectric materials; glass; laser damage; damage threshold; surface studies; cracks; shock waves; cleavage; refractive index

91. Honeycutt, J. H., "Rapid Heating and Loading of 7075-T6 Aluminum Alloy Sheet", Report No. RS-TR-70-6, Redstone Arsenal (May 1970). (AD 176 769)

Aluminum alloys; 7075; rapid heating; elevated temperature; ultimate tensile strength; tensile yield strength; elongation; modulus of elasticity; stress-strain data; strain rate

92. Johnson, C. R.,and Grimsley, J. D., "Short-Time Stress Rupture of Prestressed Titanium Alloys Under Rapid Heating Conditions", NASA Technical Note D-6052 (November 1970).

Titanium alloys; Ti-5Al-2.5Sn; Ti-5Al-5Sn-5Zr; Ti-6Al-2Sn-4Zr-2Mo; Ti-6Al-4V; rapid heating; short time; elevated temperature; tensile properties; ultimate tensile strength; elongation; creep rupture strength

93. Korunchikov, A. I., Panteleev, V. V., Putrenko, O. I., and Yankovskii, A. A., "Yield of Metal Substance for Metals Exposed to the Action of Laser Radiation", Zhurnal Prikladnoy Spektroskopii, 12 (5), 819-823 (1970).

Tin; lead; zinc; magnesium; aluminum; copper; nickel; iron; molybdenum; tungsten; carbon; laser effect; review; surface studies; thermal properties

94. Nesterov, L. A., Poplavskii, A. A., Fersman, I. A., and Khazov, L. D., "Variation of Destruction Threshold of a Transparent Dielectric With Laser Pulse Length", Soviet Physics - Technical Physics, 15 (3), 505-507 (September 1970).

Dielectric materials; sapphire; glass; laser damage; damage threshold; thermal diffusivity

95. Perry, F. C., "Electron Beam Induced Stress Waves in Solids", Applied Physics Letters, 17 (11), 478-481 (December 1, 1970).

Aluminum alloys; 6061-T6; electron beam heating; rapid heating; short time; strain rate; stress intensity; spalling; shock waves

96. Zeldovich, Y. B., and Rayzer, Y. P., "Mechanical Effects Accompanying the Interaction of Laser Radiation With a Substance (Section 8)", Translation FTD-HT-23-322-73, Foreign Technology Division, Air Force Systems Command (1970). (AD 763 258)

Carbon; glass; quartz; Plexiglass; polystyrene; surface studies; laser effect; shock waves; mechanical properties

97. Zhiryakov, B. M., Fannibo, A. K., and Yuryshev, N. N., "Possible Technological Use of Quasi Steady State Ruby Laser Radiation", Fizika i Khimiya Obrabotki Materialov, (3), 14-24 (1970).

Vanadium; niobium; stainless steel; laser effect; thermal conductivity

1971

98. "Saturation of Iron With Tungsten During the Action of a Laser Light Beam", Izvestiya VUZ, Chernaya Metallurgiya, 14 (2), 98-101 (1971).

Tungsten powder; tungsten coatings; iron alloy substrates; laser effect; phase transformation; deformation; microstructure

99. "Ratios of Liquid and Gaseous Phases During the Action of Focused Laser Radiation on Metals", Fizika i Khimiya Obrabotki Materialov, (1), 8-12 (1971).

Copper alloys; iron alloys; aluminum alloys; tin alloys; laser effect; laser damage; surface studies; vaporization; surface removal; time

100. Agranat, M. B., Krasyuk, I. K., Novikov, N. P., et al., "Mechanical Damage in Polymers Caused by Laser Pulses", Polymer Mechanics, 7 (3), 389-395 (May/June 1971).

Polymers; polymethylmethacrylate; polystyrene; laser damage; damage threshold; microcracking; crack growth rate

101. Agranat, M. B., Krasyuk, I. K., Novikov, N. P., et al., "Destruction of Transparent Dielectrics by Laser Radiation", Soviet Physics JETP, 33 (5), 944-948 (November 1971).

Polymers; polymethylmethacrylate; polystyrene; polycarbonate; laser damage; damage thresholds; cracking; dielectric properties; destructive testing

102. Babcock, S. G., et al., "Characterization of Three Aluminum Alloys", Final Report AMMRC CR 71-3, General Motors Technical Center, Warren, Michigan, Contract DAAG-46-69-C-0127 (January 1971). (AD 724 195)

Aluminum alloys; 6061-T6; 2014-T6; 2024-T3; rapid heating; short time; elevated temperature; strain rate; hardening; tensile properties; ultimate tensile strength; tensile yield strength; modulus of elasticity; spalling; ultrasonic testing; fracture

103. Basov, N. G., Krokhin, O. N., Morachevskiy, N. V., et al., "Volume and Surface Effects Occurring as a Result of the Action of Laser Radiation of Optical Glass", Zhurnal Prikladnoy Mekhaniki i Tekhnicheskoy Fiziki, 44-49 (1971).

Glass; laser effect; surface studies; cracking; splitting; failure; microstructure

104. Bennett, H. S., "Damage to Ceramics From High Intensity Q-Switched Lasers", Material Science Research, 5, 537-546 (1971).

Glass; laser damage; surface studies; absorption; metal addition; thermal stress; failure; microstructure; modeling

105. Boyko, Yu. I., and Libenson, A. A., "Thermal Self Focusing of Laser Radiation in Alkali Halide Single Crystals", Fizika Tverdogo Tela, 13 (2), 656-658 (1971).

Alkali halides; sodium chloride; potassium bromide; potassium chloride; single crystals; laser effect; surface studies; refractive index; thermal expansion

106. Boyko, Yu. I., Geguzin, Y. Y., and Emets, A. K., "Nature of Deformation in the Region of Laser Beam Pulsed Action on a Cesium Iodide Single Crystal", Fizika Tverdogo Tela, 13 (10), 3096-3097 (1971).

Cesium iodide; single crystals; laser damage; deformation; surface studies

107. Chernenko, V. S., Kovalenko, V. S., and Volosevich, P. Yu., "Effect of the Original Structure of Steel During Heating by a Photon Beam", Metal Science and Heat Treatment, 13 (7/8), 596 (July/August 1971).

ShKh15; engineering steel; Russian alloys; laser effect; heat affected zone; penetration depth; microstructure; martensite; austenite

108. DeShazer, L. G., and Parks, J. H., "Understanding the Physics of Laser Damage to Thin Dielectric Films", National Bureau of Standards Special Publication 356, 124-136 (1971).

Thin films; dielectric coatings; magnesium fluoride coatings; zinc sulfide coatings; thorium oxyfluoride coatings; silicon oxide coatings; aluminum oxide coatings; titanium oxide coatings; sodium chloride substrate; laser damage; scanning electron microscope; surface studies

109. Diaconis, N. S., et al., "Graphite Melting Behavior", Technical Report AFML-TR-71-119, General Electric Company, Contract F 33(615)-68-C-1713 (July 1971). (AD 727 064)

Graphite; laser effect; heating; melting; vaporization; surface studies; degradation; microstructure; phase diagram

110. Fersman, I. A., Khazov, L. D., and Tikhomirov, G. P., "Stages of Surface Fracture of a Transparent Dielectric During Laser Irradiation", Kvantovaia Elektronika (Moscow), (3), 61-66 (1971).

Dielectric materials; laser effect; surface studies; fracture mechanics; dielectric properties; optical properties; reflectivity; electron microscopy

111. Gordienko, A. I., and Ivashko, V. V., "Scale Formation and Gas Pick Up of Titanium Alloys During Rapid Heating", Voprosy Prochnosti i Plastichnosti Metallov (Minsk), 58-59 (1971).

Russian alloys; titanium alloys; VT14; VT15; rapid heating; surface studies; oxide coating; weight change

112. Hauser, D., and Wright, J. W., Jr., "Tensile Behavior of High-Strength Alloys During Rapid Heating", SAMPE Space Shuttle Materials Technical Conference, 287-295 (October 1971).

Maraging (250); Maraging (300); titanium alloys; Ti-6Al-4V; aluminum alloys; 7075-T6; rapid heating; elevated temperature; ultimate tensile strength; tensile yield strength; elongation; reduction in area

113. Hauser, D., and Howden, D. G., "Evaluation of Creep During Rapid Heating", Methods High-Alloy Weldability Evaluation Proceedings Symposium, 1969, (Welding Research Council, New York), 16-21 (1971).

Maraging (250); titanium alloys; Ti-6Al-4V; aluminum alloys; 7075-T6; rapid heating; short time; elevated temperature; plastic deformation; creep rupture strength; phase transformation; microstructure

114. Hibben, S. G., "Effects of High Power Lasers", ASOSR-TR-72-0486, Informatics Incorporated, Contract F44620-70-C-0081 (December 7, 1971). (AD 737 570)

Iron alloys; cast iron; laser effect; cratering

Mirrors; dielectric coatings; lead oxide coatings; cryolite coatings; zinc sulfide coatings; magnesium fluoride coatings; lasereffect; damage threshold; stability

Niobium; brass; copper; stainless steel; aluminum; laser effect; damage threshold

Nickel coatings; quartz substrate; laser effect; damage threshold; electrical resistivity

Cast iron; laser effect; pitting; hardness

115. Il'ina, K. N., Kovalev, A. A., Kuznetsov, A. E., et al., "Initial Stage of Laser-Induced Crack Development in Polymethyl Methacrylate", Polymer Mechanics, 7 (3), 491-493 (May-June 1971).

Polymethylmethacrylate; zinc additions; laser effect; degradation; cracking; surface studies

116. Karasev, I. G., Kirillov, V. M., Norskii, V. E., et al., "Disintegration of Metals by a Laser Beam" Soviet Physics - Technical Physics, 15 (9), 1523-1527 (March 1971). Translation of Zhurnal Tekhnicheskoy Fiziki, 40 (9), 1954-1959 (September 1970).

Copper; molybdenum; nickel; zinc; stainless steel; 30KhGSA; aluminum; iron; tin; laser damage; holes; physical properties; destructive test; short time; cratering; erosion; vaporization; melting; burn-through data; surface studies

117. Kazakevich, V. I., and Babikova, Yu. F., "Autoradiographic Study of the Penetration of Impurities into Silicon During the Action of Pulsed Thermal Gradient Sources of Heat", Metallurgiia i Metallovedenie Chistyki Metalov, (9), 169-172 (1971).

Silicon; nickel addition; phosphorus additon; bismuth addition; laser effect; melting; crystal structure; recrystallization; nondestructive testing; radiography

118. Kidin, I. N., Medvedev, V. V., and Mochalov, B. V., "Effect of Recovery and Recrystallization on the Mechanical Properties of Niobium During Short Term Heating", Izvestiya VUZ, Chernaya Metallurgiya, 14 (9), 126-128 (1971).

Niobium; rapid heating; short time; elevated temperature; metallography; microstructure; recrystallization; mechanical properties

119. Kidin, I. N., Andryushechkin, V. I., and Delevi, V. G., "Structure and Phase Composition of the Surface Layer in the Diffusion of Chromium into Steel Under Rapid Heating Conditions", Zashchitnye Pokrytiia Na Metallakh, (4), 180-187 (1971).

Engineering steel; carbon steel; chromium coatings; rapid heating; metallography; microstructure; phase studies; sigma phase; austenite

120. Keisling, W., Jr., and Lowe, D. L., "Elevated Temperature Tensile Properties of Ti-6Al-4V", General Electric Missile and Space Division, Philadelphia, Pennsylvania, Internal Communication to R. Hockridge (October 8, 1971).

Titanium alloys; Ti-6Al-4V; rapid heating; short time; elevated temperature; design allowables; tensile properties; ultimate tensile strength; tensile yield strength; elongation; modulus of elasticity; stress-strain data

121. Komotskii, V. A., "Greatest Possible Rate of Evaporation From the Surface of a Metal", Zhurnal Tekhnicheskoy Fiziki, 41 (1), 220-221 (January 1971). Translation: Soviet Physics - Technical Physics, 16 (1), 168-169 (July 1971).

Thin films; aluminum coatings; transparent substrates; laser effect; evaporation; surface studies; cracking; splitting; surface removal; explosive deformation; destructive tests

122. Kulyapin, V. M., "Problems of Thermal Conductivity in Phase Transitions", Inzhenerno-Fizicheskiy Zhurnal, (3), 497-504 (1971).

Aluminum alloys; Armco iron; iron; engineering steel; U-8; laser effect; surface studies; phase transformation; thermal conductivity

123. Levinson, G. R., and Smilga, V. I., "Experimental Study of the Rupture Threshold of Thin Metal Films Subjected to Laser Irradiation", Fizika i Khimiya Obrabotki Materialov, (4), 124-128 (July-August 1971).

Thin films; silver coatings; aluminum coatings; gold coatings; chromium coatings; copper coatings; quartz substrates; laser effect; damage threshold; adhesion; decomposition; destruction; surface studies

124. Lokhov, Yu. N., Mospanov, V. S., and Fiveyskiy, Yu. D., "Thermoelastic Stresses in Solid Transparent Dielectrics Which Form Under the Effect of a Focused Laser Beam", Kvantovaya Elektronika, (3), 67-72 (1971).

Dielectric materials; laser effect; thermal properties; thermoelasticity; thermal conductivity; thermal stress

125. Mezokh, Z. I., Ivanov, L. I., and Yanushkevich, V. A., "Changes in Electric Properties of N-Type Germanium Under Laser Pulse Action in a Modulated Q System at 77 K", Nekot Vop Diffuz Rastvoren Veshchestv Porakh Sorbentov, 102-109 (1971).

Germanium; quartz substrate; laser effect; low temperature; liquid nitrogen environment; electrical properties; electrical resistivity

126. Mirkin, L. I., "Dynamic Deformation of Low Carbon Steels Under the Effect of a Laser Light Beam", Referativnyy Zhurnal, Metallurgiya, 109-112 (1971).

Engineering steel; carbon steel; laser effect; microstructure; twinning; deformation

127. Neuroth, N., Hasse, R., and Knecht, A., "Damage by Laser Radiation of Imrpoved Neodymium-Activated Laser Glass, Colored Glasses, and Optical Glasses", National Bureau of Standards Special Publication 356, 3-14 (1971).

Glass; laser effect; laser damage; surface studies; optical properties

128. Petukhova, T. M., and Senkevich, V. F., "Formation of Pitting in Cast Iron Under a Laser Beam", Izvestiya VUZ, Chernaya Metallurgiya, (6), 138-144 (1971).

Cast iron; laser effect; surface studies; thermal shock; pitting

129. Ready, J. F., Effects of High-Power Laser Radiation, Academic Press, New York (1971), pp 114-123, 277-314.

Teflon; aluminum; tin; copper; carbon; silver; laser effect; reflectivity; surface studies

Stainless steel; brass; aluminum; laser effect; surface studies; cratering; holes

Glass; ruby; alkali halides; polymers; polymethylmethacrylate; polystyrene; laser damage; cracking; damage threshold; photoconductivity; surface studies

130. Romanov, G. S., and Stepanov, K., "Screening of a Metal Surface by Fracture Products Generated by Low Density Laser Radiation", Translation FSTC-HT-23-1156-71, Army Foreign Science and Technology Center (October 20, 1971). (AD 733 768)

Aluminum; laser damage; surface studies; absorption; theoretical

131. Shiozawa, L. R., Jost, J. M., Roberts, D. A., and Smith, J. M., "Single Crystal Cadmium Telluride High Energy IR Laser Windows", Technical Progress Report, Gould Inc., Contract F 33(615)-71-C-1777 (September 1971).

Cadmium sulfide; laser damage; cratering; cracking; absorption; oxidation; surface studies

132. Stefansky, T., and Shea, J., "Dynamic Fracture Experiments Using High-Energy Pulsed Electron Beams", Final Report, DASA-2699, Physics International Company, Contract DADA 01-68-C-0138 (July 1971). (AD 727 983)

Aluminum alloys; 6061-T6; titanium; copper; electron beam heating; rapid heating; damage threshold; fracture; spalling; cracking; density; shear modulus; tensile yield strength; degradation

133. Stefansky, T., et al., "Material Properties Measurements Using Pulsed Electron Beams", Final Report AMMRC CR 71-9, Physics International Co., Contract DAAG 46-69-C-0126 (July 1971). (AD 729 364)

Aluminum alloys; 2014-T6; titanium; rapid heating; electron beam heating; short time; elevated temperature; degradation; modulus of elasticity; tensile yield strength; penetration depth

134. Stefansky, T., et al., "Temperature-Induced Degradation of Mechanical Properties Following Instantaneous Heating", Report AFWL-TR-71-62, Physics International Co., Contract F29601-70-C-0011 (September 1971).

Aluminum alloys; 6061; resin matrix composites; rapid heating; elevated temperature; electron beam heating; strain rate; thermal degradation; ultimate tensile strength; tensile yield strength; modulus of elasticity

135. Sultanov, M. A., "Damage Caused to Polymer Films by Laser Radiation and its Relation to the Nature and Structure of the Material", Polymer Mechanics, 7 (6), 968-971 (November/December 1971). Translation of Mekhanika Polimerov, (6), 1092-1093 (1971).

Thin films; polymer coatings; polyethylene coatings; Dacron coatings; polypropylene coatings; Teflon coatings; Kapron coatings; surface studies; microstructure; physical properties; chemical properties; reflectivity; photolysis; explosion; shock waves; degradation; destruction

136. Triebes, K., Shea, J., and Stefansky, T., "Thermal Degradation of Mechanical Properties for 6Al-4V and 13V-11Cr-3Al Titanium Alloys", PIFR-336, Physics International Co., prepared for University of California, Lawrence Livermore Laboratory Contract No. P. O. 5472509 (August 1971).

Titanium alloys; Ti-6Al-4V; Ti-13V-11Cr-3Al; rapid heating; elevated temperature; thermal degradation; mechanical properties

137. Trink, S., "Laser Cutting Manufacturing Methods", Interim Engineering Progress Report IR-731-1(I), Grumman Aerospace Corporation, Contract F 33(615)-71-C-1949 (November 1971). (AD 178 699)

Ti-6Al-4V; Hastelloy X; Rene 41; TD-Nickel-Cr; Haynes 188; AISI 410; AISI 4340; Ti-6Al-6V-2Sn; laser cutting; heat affected zone; nondestructive test; microstructure

138. Turner, A. F., "Ruby Laser Damage Thresholds in Evaporated Thin Films and Multilayer Coatings", National Bureau of Standards Special Publication 356, 119-123 (1971).

Thin films; thorium fluoride coatings; silicon oxide coatings; magnesium fluoride coatings; aluminum oxide coatings; calcium fluoride coatings; zirconium oxide coatings; titanium oxide coatings; lithium fluoride coatings; magnesium oxide coatings; cerium oxide coatings; zinc sulfide coatings; laser damage; damage thresholds; surface studies

139. Voropay, Ye. S., and Sarzhevskiy, A. M., "Luminescence of Transparent Solid Materials Under the Action of Laser Radiation", Zhurnal Prikladnoy Spektroskopii, 14, 534-536 (1971).

Glass; quartz; Plexiglass; laser effect; surface studies; cratering; optical properties; luminescence

140. Wood, R. M., Tait, J. M., and Rouse, R. L., "Investigation of Dielectric Optical Coatings for Lasers", Annual Report 3, DRIC BR-28067, General Electric Company, Ltd., (December 1971). (AD 891 768)

Cerium oxide coatings; zinc sulfide coatings; thorium fluoride coatings; magnesium fluoride coatings; laser damage; dielectric properties; hardness; surface studies

141. Zakharov, V. P., Tsvirko, Yu. A., and Chugaev, V. N., "Recrystallization of Thin Semiconductor Films Under Laser Radiation", Protsessy Sinteza i Rosta Kristallov Plenok Poluprovodnikoriykh Materialov Simpozium, 270-273 (1971).

Thin films; semiconductor materials; germanium; laser effect; recrystallization; microstructure

142. Zhiryakov, B. M., Rykalin, N. N., Uglov, A. A., et al., "Characteristics of the Damage Imparted to Metals by a Focused Laser Beam", Zhurnal Tekhnicheskoy Fiziki, 41 (5), 1037-1042 (May 1971).

Zirconium; laser effect; surface studies; cratering; surface removal; melting

143. Zhukov, A. A., and Krishtal, M. A. "Transformations in Cementite Under a High Rate of Heating and Quench Hardening", Liteynoye Proizvodstvo, (5), 34-36 (1971).

Iron carbide; laser effect; microstructure; phase transformations; heating; cooling; quenching; hardening

1972

144. "Thermophysical Characterization of Advanced Materials Under Transient Heating Conditions", Third Quarterly Report, General Electric Company, Contract NAS 1-10805 (March 1972). (AD 179 079)

Graphite; phenolics; rapid heating; short time; thermal expansion; thermal conductivity

145. Aboelfotoh, M. O. and Von Gutfeld, R. J., "Effects of Pulsed Laser Radiation on Thin Aluminum Films", Journal of Applied Physics, 43 (9), 3789-3794 (1972).

Thin films; aluminum coatings; Mylar substrates; laser effect; laser damage; surface studies

146. Akulenok, E. M., Danileiko, Yu. K., et al., "Mechanism of the Destruction of Ruby Crystals by Laser Radiation", Pis'ma Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 16 (6), 336-339 (1972).

Ruby; aluminum oxide; single crystals; laser damage; destructive test

147. Anderholm, N. C., and Anderson, P. D., "Laser-Heating Studies of Composite Materials", Journal of Applied Physics, 43 (4), 1820-1825 (1972).

Fiber reinforced composites; resin matrix composites; carbon/resin composite; polymethylmethacrylate; polyethylene; laser effect; heating; microstructure; crystal structure

148. Arkhipov, Yu. V., Morachevskii, N. V., Morozov, V. V., et al., "Energy Balance and Destruction Dynamics of Transparent Dielectrics During Laser Irradiation", Fizika Tverdago Tela (Leningrad), 14 (6), 1756-1760 (1972).

Dielectric materials; glass; quartz; laser effect; laser damage; destructive test

149. Austin, R. R., Michaud, R. C., Guenther, A. H., et al., "Influence of Structural Effect on Laser Damage Thresholds of Discrete and Inhomogeneous Thin Films and Multilayers", National Bureau of Standards Special Publication 372, 135-164 (1972).

Thin films; silicon oxide coatings; zinc sulfide coatings; fluoride coatings; magnesium difluoride coatings; thorium tetrafluoride coatings; laser damage; damage threshold; microstructure

150. Avotin, S. S., Krivchikova, E. P., Papirov, I. I., et al., "Alteration of the Electric Resistance of Laser Irradiated Beryllium", Zhurnal Eksperimentalnoy i Teoreticheskoy Fiziki, 62 (1), 288-293 (1972).

Thin films; foils; beryllium; laser effect; electrical properties; electrical resistivity

151. Bass, M., and Barrett, H. H., "Laser-Induced Damage Probability at 1.06 and 0.69 Microns", National Bureau of Standards Special Publication 372, 58-69 (1972).

Dielectric materials; potassium phosphate; quartz; lithium niobate; lithium iodate; strontium titanate; laser damage; surface studies

152. Bates, R. D., Jr., Cook, C. F., Jr., Shappirio, J. R., et al., "Interaction of Semiconductor Materials with Laser Radiation at 10.6 Micrometers", Technical Report ECOM-4059, U.S. Army Electronics Command (December 1972).

Semiconductor materials; silicon; laser effect; laser damage; surface studies; pitting; surface roughness; cracking; holes; deformation

153. Bedilov, M. R., Khaidarov, K., and Babadzhanova, Kh., "Nature of Radiation Defects Formed on the Surface of Solids by Ruby Laser Radiation", Izvestiya Akademii Nauk Uzbekskoy SSR, Seriya Fiziko Matematichekikh Nauk, 16 (2), 66-68 (1972).

Tungsten; molybdenum; nickel; zinc; silicon; laser effect; surface studies; defects

154. Belozerov, S. A., Zverev, G. M., Naumov, V. S., and Pashkov, V. A., "Breakdown of Transparent Dielectrics by the Radiation From Mode-Locked Lasers", Soviet Physics JETP, 35 (1), 158-160 (July 1972).

Glass; ruby; sapphire; quartz; dielectric materials; laser effect; laser damage; damage threshold; microcracking; cratering; thermal conductivity; thermal properties; surface studies

155. Bertolotti, M., Sette, D., Stagni, L., et al., "Electron Microscope Observation of Laser Damage on Gallium Arsenide, Gallium Antimonide, and Indium Antimonide", Radiation Effects, 16 (3-4), 197-202 (1972).

Gallium arsenide; gallium antimonide; indium antimonide; laser effect; laser damage; microstructure

156. Bliss, E. S., Milam, D., and Bradbury, R. A., "Laser Induced Damage to Mirrors at Two Pulse Durations", Technical Report No. 2, AFCRL-72-0423, Air Force Cambridge Research Laboratories (July 1972).

Dielectric materials; mirrors; titanium oxide coatings; zirconium oxide coatings; zinc sulfide coatings; silicon oxide substrates; thorium fluoride substrates; laser damage; fogging; damage threshold; absorption; defects; surface studies

157. Boling, N. L., and Dube, G., "Laser-Induced Damage to Glass Surfaces", National Bureau of Standards Special Publication 372, 40-45 (1972).

Glass; laser damage; damage threshold; surface studies

158. Boling, N. L., and Dube, G., "Damage Threshold Studies of Glass Laser Materials", Semi-Annual Technical Report, Owens-Illinois Inc., Contract DAHC15-72-C-0170 (December 1972).

Laser materials; dielectric materials; glasses; laser damage; damage threshold; surface studies; measurement

159. Cervay, R. R., and Petrak, G. J., "A Note on Fatigue Crack Starter Defects Produced by a Pulsed Laser", Engineering Fracture Mechanics, 4 (4), 991-993 (December 1972).

Aluminum alloys; engineering steel; laser effect; fatigue tests; fracture mechanics; embrittlement; crack nucleation

160. Condell, W. J., "Laser Damage of Optical Elements", Technical Report ONRL-M-3-72, Office of Naval Research, London (October 1972). (AD 906 565L)

Mirrors; optical coatings; laser damage; surface studies

161. Edwards, D. F., and She, C. Y., "Laser Produced Damage in Transparent Solids", Technical Report, Colorado State University (1972). (AD 740 951)

Quartz; laser damage; damage threshold; surface studies; microstructure

162. Eleiche, A.S.M., "A Literature Survey of the Combined Effects of Strain Rate and Elevated Temperature on the Mechanical Properties of Metals", Report AFML-TR-72-125, Brown University, Contract F 33(615)-71-C-1308 (September 1972).

Aluminum; aluminum alloys; 1100 aluminum; 2024; 5052; 6061; 7075; beryllium alloys; I-400; S-200E; copper; copper alloys; Cu-20Zn (brass); Cu-5Sn (bronze); iron; magnesium; molybdenum; nickel; niobium; engineering steel; stainless steel; 18/8 stainless; AISI 316; titanium alloys; Ti-6Al-4V; rapid heating; short time; elevated temperature; strain rate; stress-strain data; compressive properties; tensile properties; ultimate tensile strength; reduction in area; elongation; ductility; modulus of elasticity; fracture

163. Fairand, B. P., Wilcox, B. A., Gallagher, W. J., and Williams, D. N., "Laser Shock-Induced Microstructural and Mechanical Property Changes in 7075 Aluminum", Journal of Applied Physics, 43 (9), 3893-3895 (September 9, 1972).

Aluminum alloys; 7075-T73; laser effect; microstructure; ultimate tensile strength; tensile yield strength; elongation; strengthening; shock hardening; dislocations

164. Feldman, A., Horowitz, D., and Waxler, R. M., "Laser Damage in Materials", Semi-Annual Report, NBS 10894, National Bureau of Standards (July 1972). (AD 747 290)

Glass; borosilicate glass; fused silica; flint glass; laser damage; damage threshold; surface studies

165. Field, J. E., and Zafar, M. A., "Effect of Surface Films on Laser Damage in Glasses", Journal of Physics D, 5 (11), 2105-2114 (1972).

Glass substrates; carbon coatings; laser damage; surface studies

166. Fradin, D. W., Yablonovitch, E., and Bass, M., "Comparison of Laser Induced Bulk Damage in Alkali-Halides at 10.6, 1.06, and 0.69 Microns", National Bureau of Standards Special Publication 372, 27-39 (1972).

Alkali halides; laser damage; microstructure; bulk damage; surface studies; surface damage

167. Gilbert, K. G., and Reinke, R., "Rapid Laser Heating of Metals Under Constant Uniaxial Stress", Report AFWL-TR-72-12, Air Force Weapons Laboratory, Kirtland AFB, New Mexico (May 1972). (AD 900 865L)

Aluminum alloys; magnesium alloys; stainless steel; laser effect; mechanical properties; tensile properties; thermodynamic properties

168. Giuliano, C. R., and Tseng, D. Y., "Laser Induced Damage to Nonlinear Optical Materials", Technical Report AFCRL-72-0455, Hughes Aircraft Company, Hughes Research Laboratory, Contract F 33(615)-71-C-1715 (September 1972). (AD 748 935)

Optical materials; lithium iodate; proustite; laser damage; damage threshold; surface studies

169. Giuliano, C. R., "Laser-Induced Damage in Transparent Dielectrics. Ion Beam Polishing as a Means of Increasing Surface Damage Thresholds", Physics Letters, 21 (1), 39-41 (1972).

Dielectric materials; sapphire; laser damage; surface studies

170. Giuliano, C. R., "Laser-Induced Damage in Transparent Dielectrics. Relation Between Surface Damage and Surface Plasmas", IEEE Journal Quantum Electronics, 8 (9), 749-754 (1972).

Dielectric materials; laser damage; surface studies

171. Golubets, V. M., Moysa, M. I., Babey, Yu. I., et al., "The Effect of Laser Treatment on the Deterioration of Details in an Abrasive Oil Medium", Fiziko-Khimicheskaya Mekhanika Materialov, 8 (4), 114-115 (1972).

Engineering steel; iron; laser effect; physical properties; mechanical properties; microstructure; wear

172. Gridnev, V. N., Ivasishin, O. M., et al., "Inheritance of Alpha-Phase Defect Structure by Austenite During the Rapid Heating of U9 Carbon Steel", Metallofizika, No. 39, 69-75 (1972).

Engineering steel; carbon steel; Russian alloys; U-9; rapid heating; phase transformation; microstructure; deformation

173. Griffin, R. B., and Pepe, J., "Rapidly Austenitized Low Carbon Steel", Technical Report WVT-7252, Watervliet Arsenal (October 1972). (AD 180 903)

Engineering steel; AISI 1010; rapid heating; elevated temperature; short time; metallography; phase transformation; microstructure; phase diagrams

174. Grigoriew, H., "Electron-Microscopic Studies of Structural Changes in Glass Irradiated by Neodymium Laser", Szkloi Ceramika, 23 (3), 72-77 (1972).

Glass; laser effect; microstructure

175. Gryaznov, I. M., Kovalev, A. A., Mirkin, L. I., et al., "Melt Zones and Thermal Effect in Metals During the Action of Laser Radiation of Different Duration", Fizika i Khimiya Obrabotki Materialov, (5), 8-10 (1972).

Iron alloys; Armco iron; engineering steel; 45 steel; Russian alloys; laser effect; heat affected zone; melting; surface studies; microstructure

176. Gulyaeva, A. S., Krasyuk, B. A., Maslov, V. N., et al., "Change in the Photoluminescence of Gallium Arsenide Single Crystals in Regions Damaged by a Laser Beam", Doklady Akademii Nauk SSR, 205 (4), 815-817 (1972).

Gallium arsenide; single crystals; laser damage; surface studies; photoluminescence

177. Howard, J. K., and Ross, R. F., "Effect of Laser Irradiation on Microstructure and Electromigration in Aluminum Films", Thin Solid Films, 14 (1), 119-134 (1972).

Aluminum; thin films; laser effect; laser damage; microstructure; vaporization; grain growth; grain size; melting; plastic deformation; electromigration; thermal gradients

178. Kembry, K., and MacPherson, R. W., "CO_2 Laser Induced Breakdown and Damage to Surfaces of Laser Optical Materials", Technical Report DREV IN-2013/72, Defence Research Establishment, Valcartier, Quebec (July 1972). (AD 903 868)

Laser materials; window materials; sodium chloride; laser damage; damage thresholds; surface studies

179. Lipkin, J., et al., "Mechanical Properties of 6061-T6 Aluminum After Rapid Heating", Report SC-RR-72-0020, Sandia Laboratories (March 1972).

Aluminum alloys; 6061-T6; rapid heating; mechanical properties

180. Litvinov, V. S., and Pantsyreva, E. G., "Features of the Deformation and Fracture of Ni-Al Compounds Due to Large Thermal Pulses", Russian Metallurgy, (4), 130-133 (1972).

Nickel aluminide; nickel compounds; intermetallic compounds; laser effect; cratering; microcracking; plastic deformation; thermal shock; martensite transformation; microhardness; surface studies; physical properties

181. Newman, R. L., "Prediction of Thermal-Shock Resistance During Heating at Very High Rates", Journal of the American Ceramic Society, 55 (9), 464-469 (1972).

Ceramic materials; rapid heating; spalling; cracking; shear stress; failure; surface studies

182. Ng, R., and Butcher, B. M., "The Dynamic Response of Heated Porous Aluminum", Technical Report SC-RR-710790, Sandia Laboratories (January 1972). (AD 181 104)

Aluminum alloys; 2024; fused silica; rapid heating; electron beam heating; softening; density; melting; spalling; surface studies

183. Orekhov, M. V., and Slavin, B. S., "Nature of the Removal of Matter During the Action of Laser Radiation on Materials With Different Thermophysical Properties", Zhurnal Prikladnol Spektroskopiya, 16 (1), 153-155 (1972). Translation of Journal of Applied Spectroscopy, 16 (1), 118-120 (January 1972).

Iron; engineering steel; laser effect; surface removal; thermal diffusivity; thermal conductivity; cratering; fracture; surface studies

184. Orlov, A. A., and Ulyakov, P. I., "The Development of Volumetric Failure in Silicate Glasses and Polymers Under the Action of Laser Radiation", Journal of Applied Mechanics and Technical Physics, 13 (4), 551-556 (July-August 1972).

Silicate glasses; polymethylmethacrylate; laser effect; cracking; overheating; degradation; surface studies; microstructure

185. Petukhova, T. M., Bukhalenkov, V. V., and Grokhovskii, V. I., "State of a Metallic Surface After Laser Irradiation", Elektronnaya Obrabotka Materialov, (4), 28-31 (1972).

Iron alloys; stainless steel; 1Kh18N8; engineering steel; 30Kh10G10; laser effect; surface studies; cratering; hardening; deformation; microstructure; phase transformation; microhardness

186. Pitha, C. A., "Conference on High Power Infrared Laser Window Materials October 30, 31, and November 1, 1972. Volume I", Special Report, AFCRL-SR-Vol-1, AFCRL-TR-73-0372(I) (November 1972). (AD 914 499L)

Laser window materials; alkali halides; chalcogenides; potassium chloride; cadmium telluride; zinc selenide; thin films; laser effect; optical properties; mechanical properties; thermal properties

187. Pitha, C. A., "Conference on High Power Infrared Laser Window Materials October 30, 31, and November 1, 1972. Volume II", Special Report AFCRL-SR-Vol-2, AFCRL-TR-73-0372(I) (November 1972). (AD 914 501L)

Laser window materials; alkali halides; chalcogenides; potassium chloride; cadmium telluride; zinc selenide; thin films; laser effect; strengthening; surface studies; optical properties; mechanical properties; thermal properties

188. Poulsen, P. D., "Laser Modification of Thin Gold Film. Transmittance and Reflectance", Applied Optics, 11 (4), 949 (1972).

Thin films; gold coatings; quartz substrates; laser damage; surface studies; reflectivity

189. Rykalin, N. N., Uglov, A. A., and Kokora, A. N., "Action of Laser Radiation on Iron Alloys", Fizika i Khimiya Obrabotki Materialov, No. 6, 14-21 (1972).

Iron alloys; engineering steel; ST-45; U-8; ShKh-15; KhVG; Kh12M; laser effect; particle distribution; dislocations; microstructure; destructive test

190. Sanders, W. A., and Probst, H. B., "Evaluation of Oxidation Resistant Nonmetallic Materials at 1204 C (2200 F) in a Mach 1 Burner", Technical Report E-6918, NASA TN D-6890, NASA Lewis Research Center (August 1972). (AD 180 539)

Ceramic materials; refractory compounds; carbides; nitrides; borides; oxides; rapid heating; elevated temperature; thermal shock; thermal fatigue; density; porosity; thermal expansion; thermal conductivity; bend strength; modulus of elasticity

191. Schastlivtsev, V. M., Sadovskiy, V. D., and Drozd, V. P., "X-Ray Diffraction Analysis of the Recrystallization of a Quenched Steel During Rapid Heating", Physics of Metals and Metallography, 33 (1), 139-145 (1972).

Engineering steel; Russian alloys; 18KhNVA; 37KhN3A; 37KhN3M; 40Kh13; rapid heating; elevated temperature; metallography; grain size; recrystallization; microstructure

192. Smith, D. M., and Wiggins, T. A., "Sound Speeds and Laser Induced Damage in Polystyrene", Applied Optics, 11 (11), 2680-2683 (1972).

Polymers; polystyrene; laser damage; damage threshold; surface studies

193. Smith, J. L., "Damage to Gallium Arsenide Surfaces From Ruby and Neodymium Glass Laser Illumination", National Bureau of Standards Special Publication 372, 70-74 (1972).

Gallium arsenide; laser damage; surface studies

194. Stocking, B., Shea, J., and Dunbar, G., "Degradation of Mechanical Properties Following Sudden Heating and Compressive Shock Loading", AFWL-TR-72-67, Physics International Company, Contract F 29(601)-71-C-0072 (June 1972). (AD 904 494L)

Aluminum alloys; 6061-T6; fiber reinforced composites; quartz/phenolic composite; rapid heating; electron beam heating; short time; elevated temperature; thermal shock; ultimate tensile strength; tensile yield strength; modulus of elasticity; measurement; degradation; compressive strength

195. Suminov, V. M., and Kuzin, B. G., "Formation of Interior Surfaces by a Laser Ray Dependent on the Heat Physical Characteristics of a Processed Material (30 KhGSA Steel)", Vestnik Mashinostroyeniya, (4), 56-57 (1972).

Engineering steel; 30KhGSA; laser effect; interlayers; physical properties

196. Trink, S., "Laser Cutting Manufacturing Methods", Interim Engineering Progress Report IR-731-1(II), Grumman Aerospace Corporation, Contract F 33(615)-71-C-1949 (February 1972). (AD 178 884)

Rene 41; Hastelloy X; Haynes 188; TD-nickel-Cr; Ti-6Al-4V; Ti-6Al-6V-2Sn; AISI 410; AISI 4340; laser cutting; fatigue properties; tensile properties

197. Trink, S., "Laser Cutting Manufacturing Methods", Interim Engineering Progress Report IR-731-1(III), Grumman Aerospace Corporation, Contract F 33(615)-71-C-1949 (April 1972). (AD 179 574)

AISI 4340; AISI 410; Hastelloy X; Rene 41; TD-nickel-Cr; Haynes 188; Ti-6Al-4V; Ti-6Al-6V-2Sn; laser cutting; heat affected zone; tensile test; tensile properties

198. Uglov, A. A., Zhukov, A. A., Krishtal, M. A., and Shorshorov, M. Kh., "Displacement of the Critical Points on Heating Iron-Carbon Alloys With Laser Radiation", Fizika i Khimiya Obrabotki Materialov, (2), 3-8 (March-April 1972).

Iron alloys; carbon steel; laser effect; heating; phase transformations; thermal analysis; microhardness; microstructure

199. Whittaker, A. G., and Wolten, G. M., "Carbon: A New Hexagonal Crystal Form", Technical Report SAMSO TR-72-174, Aerospace Corporation, Contract F 04(701)-71-C-0172 (June 30, 1972). (AD 747 476)

Carbon; laser effect; heating; microstructure; crystal structure; twinning; density; transparency

200. Wieting, T. J., and Schriempf, J. T., "Free-Electron Theory and Laser Interactions With Metals", Report of NRL Progress, 1-13 (June 1972). (AD 181 043)

Stainless steel; AISI 304; aluminum alloys; nickel; laser effect; surface studies; absorption; reflectivity; electrical properties; electrical conductivity

201. Zhirovetsky, V. M., Moisa, M. I., Plyatsko, G. V., et al., "Changes in the Properties of Alloys After Treatment With a Laser Beam", Fiziko-Khimicheskaya Mekhanika Materialov, 8 (1), 84-87 (1972).

Armco iron; carbon steel; laser effect; phase transformation; microstructure

1973

202. "Action of Concentrated Laser Radiation on Thin Films", Spektroskiya Trudy Sibirskiy Soveshcheniya 6th 1968, 38-40 (1973).

Copper coatings; chromium coatings; germanium coatings; aluminum coatings; iron coatings; nickel coatings; thin films; silica substrates; surface tension; surface studies

203. Allingham, C. O., Cutter, M. A., Key, P. Y., et al., "Damage to a Transparent Substrate by Laser Light Absorption in a Thin Film", Journal of Physics D, 6 (1), 1-5 (1973).

Thin films; gold coatings; transparent substrates; laser effect; laser damage; surface studies

204. Alyassini, N., Parks, J. H., and DeShazer, L. G., "Time Resolution of Laser Induced Damage to Thin Films", National Bureau of Standards Special Publication 387, 133-137 (1973).

Zinc sulfide coatings; thin films; damage; time; reflectivity; surface studies

205. Ammann, E. O., and Wintemute, J. D., "Damage to Zinc Sulfide Thin Films From 1.08 μm Laser Radiation", Journal of the Optical Society of America, 63 (8), 965-970 (1973).

Thin films; zinc sulfide coatings; laser damage; surface studies

206. Austin, C. W., Jr., "Mechanical Behavior of 18Ni (300) Maraging Steel During Rapid Heating and at Elevated Temperatures", Technical Report RL-73-10, Redstone Arsenal (December 12, 1973). (AD 773 732)

Maraging (300); loading; rapid heating; heating rate; short time; elevated temperature; tensile yield strength; strain rate; 1200 F

207. Austin, R. R., Michaud, R., Guenther, A. H., and Putman, J., "Effects of Structure, Composition, and Stress on the Laser Damage Threshold of Homogeneous and Inhomogeneous Single Films and Multilayers", Applied Optics, 12 (4), 665-676 (April 1973).

Thin films; magnesium fluoride coatings; silicon dioxide coatings; fused silica substrates; laser effect; damage threshold; compressive strength; ultimate tensile strength; surface studies; refractive index

208. Babcock, S. G., et al., "The Effect of Very Short-Time-at-Temperature on the Yield Stress of 6061-T651 Aluminum", Journal of Testing and Evaluation, 1 (4), 353-358 (July 1973).

Aluminum alloys; 6061-T651; rapid heating; short time; elevated temperature; strain rate; metallography; tensile properties; tensile yield strength

209. Barsanti, G., Ciampi, M., Tuoni, G., et al., "Laser-Induced Structural Transformations and Surface Hardening of Carbon Steel", Metallurgia Italiana, 65 (1), 5-13 (1973).

Carbon steel; engineering steel; surface studies; laser effect; hardening; penetration depth; microhardness; phase transformation; microstructure

210. Bass, M., Fradin, D. W., and Holway, L. H., Jr., "Experimental and Investigation of Optical-Irradiation-Induced Surface Damage in Optically Nonlinear Materials", Final Report, AFCRL-72-0714, Raytheon Company, Contract F 19(628)-70-C-0223 (February 1973).

Optical materials; sodium chloride; fused quartz; strontium titanate; sodium fluoride; rubidium chloride; alkali halides; laser damage; damage threshold; surface studies; pitting; cracking; holes

211. Bass, M., Fradin, D. W., and Bua, D. P., "Visible and Infrared Laser-Induced Damage to Transparent Materials", Semiannual Technical Report AFCRL-TR-73-0494, Raytheon Company, Contract F 19(628)-73-C-0127 (September 1973).

Laser window materials; fused silica; dielectric coatings; laser damage; measurement; damage threshold; surface studies

212. Belyaev, L. M., Nabatov, V. V., Rozhanskii, V. N., et al., "Mechanism of Damaging of a Cesium Iodide Crystal Surface by a Focused Laser Beam", Kristallografiya, 18 (2), 334-338 (1973).

Cesium iodide; laser damage; surface studies

213. Bliss, E. S., Milam, D., and Bradbury, R. A., "Dielectric Mirror Damage by Laser Radiation Over a Range of Pulse Durations and Beam Radii", Applied Optics, 12 (4), 677-689 (April 1973).

Dielectric materials; mirrors; titanium oxide coatings; silicon oxide coatings; zirconium oxide coatings; zinc sulfide coatings; thorium fluoride coatings; laser effect; laser damage; morphology; pitting; damage threshold; measurement; surface studies

214. Bloembergen, N., "Role of Cracks, Pores, and Absorbing Inclusions on Laser Damage Threshold at Surfaces of Transparent Dielectrics", Applied Optics, 12 (4), 661-664 (April 1973).

Transparent materials; dielectric materials; alkali halides; glasses; aluminum oxide; zinc selenide; cadmium telluride; chalcogenide glasses; laser effect; damage threshold; surface studies; cracks; pores; refractive index; thermal stress

215. Boling, N. L., Crisp, M. D., and Dube, G., "Laser Induced Surface Damage", Applied Optics, 12 (4), 650-660 (April 1973).

Transparent materials; dielectric materials; glass; laser effect; damage threshold; surface studies; refractive index; pitting; morphology; cracking

216. Boling, N. L., and Dube, G., "Laser-Induced Inclusion Damage at Surfaces of Transparent Dielectrics", Applied Physics Letters, 23 (12), 658-660 (1973).

Dielectric materials; laser damage; damage threshold; surface studies; absorption

217. Boling, N. L., Dube, G., and Crisp, M. D., "Laser Surface Damage Studies on Several Glasses", National Bureau of Standards Special Publication 387, 69-79 (1973).

Glasses; sapphire; aluminum oxide; laser damage; surface studies; damage threshold; surface roughness

218. Bond, J. W., Jr., "High Pressures Induced by Short-Pulse Lasers", Technical Report USAMERDC-2080, Army Mobility Equipment R&D Center (November 1973). (AD 917 506L)

Aluminum; engineering steel; laser damage; spalling; fragmenting; surface studies

219. Braunlich, P. F., and Carrico, J. P., "Feasibility Study of Exoelectron Imaging as an NDT Method for Laser Surface Damage of Nonlinear Optical Materials and Laser Glass", Semi-Annual Technical Report 2, BRL Report 7058, AFCRL TR-73-0591, Bendix Research Laboratories, Contract F 19(628)-73-C-0032 (September 1973). (AD 779 799)

Optical materials; dielectric materials; lithium niobate; sodium chloride; lithium fluoride; laser damage; damage threshold; surface studies

220. Braunstein, A. I., Wang, V., Braunstein, M., Rudisill, J. E., and Wada, J., "Pulsed Carbon Dioxide Laser Damage Studies of Windows and Window Coatings", National Bureau of Standards Special Report 387, 151-156 (1973).

Potassium chloride; zinc selenide; cadmium telluride; laser windows; laser damage; arsenic sulfide coatings; barium fluoride coatings; thorium fluoride coatings; zinc sulfide coatings; damage threshold; failure; design; surface studies

221. Burdin, V. V., Grabenko, N. M., Gridnev, V. N., et al., "Formation of Austenite Below the Phase Equilibrium Temperature During the Rapid Heating of Carbon Steels", Physics of Metals and Metallography, 35 (3), 94-101 (1973).

Carbon steel; engineering steel; Russian alloys; austenite; rapid heating; heating rate; phase transformations; microstructure

222. Burenkov, G. L., Deimontovich, V. B., et al., "Changes of Structures and Concentrations in Alloys Exposed to Laser Radiation", Metallofizika, (45), 75-81 (1973).

Aluminum alloys; copper alloys; nickel alloys; silicon alloys; laser effect; X-ray analysis; microstructure; microhardness; surface roughness

223. DeShazer, L. G., Leung, K. M., Newman, B. E., and Alyassini, N., "Laser-Irradiated Thin Films", Final Report AFCRL-TR-73-0585, University of Southern California, Contract F 19(628)-71-C-0220 (August 1973). (AD 774 022)

Thin films; titanium oxide coatings; silicon oxide coatings; zirconium oxide coatings; magnesium fluoride coatings; zinc sulfide coatings; dielectric coatings; glass substrates; fused silica substrates; sodium chloride substrates; magnesium aluminate substrates; laser damage; damage threshold; surface studies

224. Feldman, A., Horowitz, D., and Waxler, R. M., "Laser Damage in Materials", Semi-Annual Report NBSIR-73-119, National Bureau of Standards (February 1973). (AD 757 789)

Glass; fused silica; laser damage; damage threshold; electrostriction; refractive index; surface studies

225. Feldman, A., Horowitz, D., and Waxler, R. M., "Laser Damage in Materials", Semi-Annual Technical Report NBSIR-73-268, National Bureau of Standards (August 1973). (AD 768 303)

Lithium niobate; calcite; potassium phosphate; laser damage; damage threshold; electrostriction; refractive index; thermal stress; microcracking

226. Fox, J. A., and Barr, D. N., "Laser-Induced Shock Effects in Plexiglas and 6061-T6 Aluminum", Applied Physics Letters, 22 (11), 594-596 (June 1, 1973).

Aluminum alloys; 6061-T6; Plexiglas; laser effect; spalling; surface studies; absorption; surface removal

227. Fradin, D. W., and Bass, M., "Comparison of Laser-Induced Surface and Bulk Damage", Applied Physics Letters, 22 (4), 157-159 (February 15, 1973).

Fused quartz; sapphire; glass; laser damage; damage threshold; pitting; cracking; voids; grooving; surface studies; microstructure

228. Fradin, D. W., Yablonovitch, E., and Bass, M., "Confirmation of an Electron Avalanche Causing Laser-Induced Bulk Damage at 1.06 Mu", Applied Optics, 12 (4), 700-709 (April 1973).

Alkali halides; sodium iodide; potassium iodide; rubidium iodide; sodium bromide; potassium bromide; rubidium bromide; sodium chloride; potassium chloride; rubidium chloride; sodium fluoride; potassium fluoride; laser effect; damage threshold; refractive index; breakdown strength; microstructure

229. Fradin, D. W., "Laser Induced Damage in Solids", Technical Report No. 643, Harvard University, Contract N00014-67-A-0298-0006 (May 1973). (AD 761 168)

Alkali halides; sodium chloride; quartz; sodium fluoride; laser damage; surface studies; optical properties; damage threshold; theory

230. Gerstle, J. H., "Elevated Temperature and Pulsed Electron Beam Effects on Low Cycle Fatigue of Beryllium", Technical Report D2-19923-2, Boeing Company, Contract F 04(701)-72-C-0210 (April 1973). (AD 909 017L)

Beryllium; rapid heating; electron beam heating; elevated temperature; stress-strain data; fatigue properties; degradation; tensile properties; hardness; grain structure

231. Giuliano, C. R., "Laser-Induced Damage in Optical Materials", Semiannual Technical Report, AFCRL TR-73-0099, Hughes Research Laboratories, Contract F 19(628)-72-C-0348 (January 1973). (AD 760 131)

Optical materials; sapphire; aluminum oxide; proustite; laser damage; surface studies; damage threshold; cratering; melting

232. Giuliano, C. R., "Laser-Induced Damage in Optical Materials", Semiannual Technical Report, AFCRL TR-73-0528, Hughes Research Laboratories, Contract F 19(628)-72-C-0348 (July 1973). (AD 768 972)

Optical materials; proustite; aluminum oxide; sapphire; lithium niobate; laser damage; damage threshold; surface studies; chemical properties; decomposition; cratering

233. Glass, A. J., and Guenther, A. H., "Laser Induced Damage in Optical Materials: 1973", Final Report NBS-SP-387, National Bureau of Standards (December 1973). (AD 773 879)

Laser materials; optical materials; infrared windows; mirrors; optical coatings; laser damage; damage threshold; absorption; surface studies

234. Glass, A. J., and Guenther, A. H., "Laser Induced Damage of Optical Elements. Status Report", Applied Optics, 12 (4), 637-649 (1973).

Dielectric materials; thin films; laser damage; damage threshold; surface studies; review

235. Gridnev, V. N., Ivasishin, O. M., Meshkov, Yu. Ya., and Oshkaderov, S. P., "Conditions of Formation of Metastable Austenite in Steel With an Imperfect Structure During Heating", Physics of Metals and Metallography, 35 (3), 108-112 (1973).

Engineering steel; steel 70; Russian alloys; rapid heating; short time; elevated temperature; thermal resistance; phase transformation; deformation; recrystallization; microstructure

236. Gulyaeva, A. S., Gurevich, M. A., Zhukova, L. A., et al., "Change in Gallium Arsenide Structure Under Laser Radiation", Fizika i Khimiya Obrabotki Materialov, (3), 17-21 (1973).

Gallium arsenide; laser effect; microstructure; dislocations

237. Gurevich, G. L., and Murav'ev, V. A., "Action of Laser Radiation on Thin Films", Fizika i Khimiya Obrabotki Materialov, (1), 3-8 (1973).

Thin films; semiconductor coatings; dielectric substrates; laser effect; damage threshold; destructive test

238. Hoffman, C. A., "Effects of Thermal Loading on Foil and Sheet Composites With Constituents of Differing Thermal Expansivities", Transactions of the ASME, Series H, Journal of Engineering Materials and Technology, 95 (1), 47-54 (January 1973). (AD D104 123)

Metal matrix composites; W/NiCr composite; laminates; rapid heating; thermal cycling; thermal expansion; elastic-plastic stresses; modulus of elasticity

239. Honeycutt, J. H., "Rapid Heating and Loading of 250- and 300-Grade Maraging Steel", Technical Report RL-73-5, Redstone Arsenal (August 1973).

Maraging (250); Maraging (300); rapid heating; short time; elevated temperature; strain rate; ultimate tensile strength; tensile yield strength; elongation; modulus of elasticity; fracture; stress-strain data

240. Hsu, T. R., "Application of the Laser Beam Technique to the Improvement of Metal Strength", Journal of Testing and Evaluation, 1, 457-458 (November 1973).

Aluminum alloys; 2024; laser effect; fatigue properties; residual stresses; ultimate tensile strength; thermal shock; strain hardening

241. Krishtal, M. A., Zhukov, A. A., and Kokora, A. N., The Structure and Properties of Alloys Treated With Laser Radiation, Metallurgiya, Moscow (1973).

Engineering steel; stainless steel; Russian alloys; 1Kh18N9T; ST-45; ST-3; Kh12M; 35KhG; 40KhG; U-8; Sh-15; EI943; EI627; laser effect; heating; cooling; heat affected zone; microstructure; composition; thermal properties; book

242. Kroger, F., and Marburger, J. H., "IR Window Studies", Quarterly Technical Report No. 6, AFCRL TR-74-0060, University of Southern California, Contract F 19(628)-72-C-0275 (December 1973). (AD 783 331)

Infrared window materials; semiconductor materials; alkali halides; gallium arsenide; laser damage; mechanical properties; optical properties; thermal properties

243. Lipkin, J., et al., "Mechanical Properties of 6061 Al-Mg-Si Alloy After Very Rapid Heating", Journal of Mechanical Physics and Solids, 21, 91-112 (1973).

Aluminum alloys; 6061-T6; rapid heating; short time; elevated temperature; electron beam heating; strain rate; tensile properties; tensile yield strength; shear modulus; modulus of elasticity; plastic deformation

244. Lisitsa, M. P., and Fekeshgazi, I. V., "Effect of Surrounding Atmospheric Pressure on the Damaging of Transparent Glass Surfaces by Laser Radiation", Kvantovaya Elektronika (Kiev), No. 7, 71-76 (1973).

Dielectric materials; glass; sodium chloride; potassium chloride; potassium bromide; alkali halides; laser damage; damage threshold; surface studies; absorption

245. McKnight, H. G., and Rothrock, L. R., "Research and Development Work for the Growth of Single Crystal Yttrium Orthovanadate", Final Technical Report ECOM-0022F, Union Carbide Corporation, Contract DAAB0772-C-0022 (April 1973). (AD 761 094)

Optical materials; yttrium orthovanadate; calcite; crystal growth; single crystals; laser damage; damage threshold; surface studies; melting; refractive index

246. Mezokh, Z. I., Ivanov, L. I., Yanushkevich, V. A., et al., "Behavior of N-Type Germanium Under the Influence of Huge Laser Pulses at 77 K", Fizika i Khimiya Obrabotki Materialov, (5), 10-14 (1973).

Germanium; laser effect; low temperature; electrical resistivity

247. Milam, D., Bradbury, R. A., Picard, R. H., and Bass, M., "Laser Damage in Dielectric Coatings - Identification of Inclusions as the Limiting Damage Mechanism and First Observation of Intrinsic Damage in Dielectric Coatings". Interim Report, AFCRL TR-73-0407, Air Force Cambridge Research Laboratories (July 10, 1973).

Zirconium silicate; titanium silicate; dielectric coatings; mirrors; laser damage; damage threshold; cratering; surface studies

248. Mirkin, L. I., "Mechanical Deformation and Destruction of Metals During the Action of Laser Light Impulse With the Duration of 10-Anion(3) Sec.", Fiziko-Khimicheskaya Mekhanika Materialov, 9 (1), 31-33 (1973).

Iron alloys; refractory metals; copper alloys; Cu-15Pt; tungsten; carbides; laser effect; cratering; deformation; cracking; destruction

249. Murr, L. E., and Payne, R. T., "Scanning Electron Microscope Study of Laser-Damaged Beryllium Thin Films", Journal of Applied Physics, 44 (4), 1722-1726 (April 1973).

Thin films; beryllium coatings; glass substrates; laser damage; melting; evaporation; degradation; thermal gradients; thermal response; surface studies; surface roughness

250. Novikov, N. P., "Origin of Laser Damage in Transparent Dielectrics of the Plexiglas Type", Polymer Mechanics, 9 (2), 204-208 (March/April 1973).

Transparent materials; dielectric materials; polymers; Plexiglas; polymethylmethacrylate; laser effect; damage threshold; cracking; degradation; gasification; surface studies

251. O'Keefe, J. D., Skeen, C. H., and York, C. M., "Laser-Induced Deformation Modes in Thin Metal Targets", Journal of Applied Physics, 44 (10), 4622-4626 (October 1973).

Aluminum alloys; 6061; stainless steel; deformation; microstructure

252. Orlov, A. A., and Ulyakov, P. I., "Orientation of Cracks Formed in Transparent Polymers Exposed to Laser Radiation", Mekhanika Polimerov, (2), 376 (1973).

Polymers; laser effect; surface studies; cracking; thermoelasticity

253. Peterson, G. E., Glass, A. M., et al., "Control of Laser Damage in Lithium Niobate", Journal of the American Ceramic Society, 56 (5), 278-282 (1973).

Lithium niobate; laser damage; surface studies; refractive index; contamination; absorption; optical properties

254. Sam, C. L., "Laser Damage of GaAs and ZnTe at 1.06 μ", Applied Optics, 12 (4), 878-879 (April 1973).

Gallium arsenide; zinc telluride; semiconductors; laser effect; damage threshold; surface studies; pitting; thickness; refractive index

255. Stegman, R. L., Schriempf, J. T., and Hettche, L. R., "Experimental Studies of Laser-Supported Absorption Waves With 5-Millisecond Pulses of 10.6-Micron Radiation", Report of NRL Progress, 25-35 (February 1973).

Aluminum alloys; 2024; stainless steel; AISI 304; graphite; fiberglass/epoxy composite; aluminum oxide; magnesium oxide; ceramic materials; laser effect; absorption; thermal coupling; vaporization; surface studies

256. Torvik, P. J., "Thermal Response Calculations and Their Role in the Design of Experiments", Technical Report AFIT-TR-73-6, Air Force Institute of Technology, Wright-Patterson AFB (December 1973). (AD 775 707)

Magnesium alloys; AZ31B; aluminum alloys; 2024; titanium alloys; Ti-6Al-4V; stainless steel; AISI 304; laser effect; heating; melting; burn-through data; surface studies; absorption; thermal response; specific heat; thermal conductivity

257. Urazaliev, U. S., Ukrainskii, Yu. M., et al., "Crystal Structure and Chemical Composition of Permalloy Thin Films Produced by Laser Radiation Pulses Under Free Generation Conditions", Fizika i Khimiya Obrabotki Materialov, (4), 151-152 (1973).

Permalloy; iron alloys; nickel addition; thin films; laser effect; crystal structure

258. Volodkina, V. L., Krylov, K. I., Libenson, M. N., et al, "Heating of Oxidizing Metal By CO_2 Laser Radiation", Doklady Akademii Nauk SSR, 210 (1), 66-69 (1973).

Aluminum; chromium; laser effect; heating; oxidation; oxide coatings; surface studies; absorption

259. Wang, V., Braunstein, A. I., Braunstein, M., Rusisill, J. E., and Wada, J. Y., "Pulsed Carbon Dioxide Laser Damage Studies of Metal and Dielectric Coated Mirrors", National Bureau of Standards Special Publication 387, 157-169 (1973).

Thin films; dielectric coatings; cadmium telluride coatings; thorium fluoride coatings; zinc telluride coatings; zinc sulfide coatings; arsenic selenide coatings; potassium chloride coatings; mirror substrates; laser damage; damage threshold; measurement; surface studies

260. Wendlandt, B.C.H., "Theoretical Studies of the Interaction Between 10.6 Micrometers Radiation and Non-Metals", Technical Note DSL-TN-318 (November 1973). (AD 917 809)

Ceramic materials; glass; polymers; laser damage; surface studies; cracking; brittleness; degradation; theory

261. Zeldovich, Y. B., and Rayzer, Y. P., "Mechanical Effects Resulting From Interactions of Laser Beams With Gases, Liquids, and Solids", Technical Report FTD-HT-23-322-73 (1973). (AD 763 258)

Glass; quartz; Plexiglas; polystyrene; laser effect; surface studies; vaporization; cratering; cracking; fracture; holes; review

1974

262. "Neutron Irradiation Embrittlement of Iron and Steel and the Laser Irradiation Embrittlement of In-Treated Steel", Ishikawajima-Harima Engineering Review, 14 (1), 42-50 (January 1974).

Iron; iron alloys; engineering steel; nitrogen addition; carbon addition; aluminum addition; laser effect; hardening; embrittlement; grain size; heat treating; microstructure; electrical resistivity; damping

263. "Shock and Compression of Solids Generated by TEA-CO_2 Laser Pulses", Eighth 1974 International Quantum Electronics Conference, San Francisco, California (June 10-13, 1974).

Glass substrates; metals; water coatings; laser effect; mechanical shock; impact properties; holes; surface studies

264. "Surface Hardening and Alloying With a Laser Beam System", Industrial Heating, 41 (7), 19-25 (July 1974).

Laser heating; heat treating; engineering steel; carbon steel; iron alloys; surface studies; hardening; hardness; alloying; melting; martensite transformation; microstructure

265. Belyaev, L. M., Golovistikov, A. N., et al., Fracture of Alkali Halide Crystals Caused by Laser Radiation, Mekhanoemissiya Mekhanokhimiya Tverdnyy Telakh, Doklady Vsesoyuznyy Simposyum, Edited by B. V. Deryagin, 2nd Edition (1974), pp 132-135.

Alkali halides; laser effect; fracture; plastic deformation; shock waves; surface studies

266. Bennett, J. M., "Statistical Characterization of Mirror and Window Surfaces", National Bureau of Standards Special Publication 414, 157-162 (1974).

Mirrors; optical materials; laser damage; surface studies; optical properties

267. Boling, N. L., and Dube, G., "Damage Threshold Studies of Glass Laser Materials", Final Technical Report, Owens-Illinois Incorporated, Contract DAHC15-72-C-0170 (August 31, 1974).

Laser materials; glasses; fused quartz; laser damage; damage threshold; contaminants; surface studies; finishing; coatings; refractive index

268. Bua, D., Statz, H., and Horrigan, F., "Laser Window Studies", Semi-Annual Technical Report S-1790, Raytheon Company, Contract DAAH01-74-C-0719 (December 1974). (AD A004 029)

Laser window materials; barium fluoride; zinc selenide; zinc sulfide; arsenic sulfide; thorium fluoride; thin films; laser effect; chemical properties; physical properties; mechanical properties; literature survey

269. Butler, C. T., Martin, J. J., Merkle, L. D., et al., "Growth and Hardening of Alkali Halides for Use in Infrared Laser Windows", Quarterly Technical Report, Oklahoma State University, Contract F 19(628)-72-C-0306 (July 1974). (AD 784 750)

Laser window materials; alkali halides; potassium chloride; potassium bromide; single crystals; laser damage; crystal growth; mechanical properties; optical properties; defects; strengthening; tensile yield strength; hardness; flow properties

270. Childers, K., and Shea, J., "Thermal Loading of Structural Materials", AFWL-TR-73-164, Physics International Company, Contract F 29(601)-72-C-0085 (January 1974). (AD 776 068)

Aluminum alloys; 6061-T6; graphite; rings; electron beam heating; thermal loading; surface studies; penetration depth; distortion

271. Cutter, M. A., Key, P. Y., and Little, V. I., "Temporal Development of Optically Etched Gratings: a New Method of Investigating Laser-Induced Damage", Applied Optics, 13 (6), 1399-1404 (June 1974).

Silver coatings; gold coatings; aluminum coatings; thin films; glass substrates; laser effect; laser damage; etching; surface studies

272. Drachinskii, A. S., Pisarenko, V. A., and Trefilov, V. I., "The Effect of Fast Heating and Cooling on Intercrystallite Damage to Light-Forged Molybdenum Alloys", Problemy Prochnosti, (4), 54-56 (1974).

Molybdenum alloys; rapid heating; crystal structure; phase transformation

273. Fairand, B. P., Clauer, A. H., Jung, R. G., and Wilcox, B. A., "Quantitative Assessment of Laser-Induced Stress Waves Generated at Confined Surfaces", Applied Physics Letters, 25 (8), 431-433 (October 15, 1974).

Iron; iron alloys; Fe-3Si; laser effect; stress waves; microstructure

274. Feldman, A., Malitson, I., Horowitz, D., et al., "Characterization of Infrared Laser Window Materials at the National Bureau of Standards", National Bureau of Standards Special Publication 414, 141-148 (1974).

Zinc selenide; arsenic sulfide; chalcogenides; glass; potassium chloride; laser effect; heating; absorption; surface studies; optical properties; distortion; refractive index; thermal expansion

275. Feldman, A., Horowitz, D., and Waxler, R. M., "Laser Damage in Materials", Technical Report, National Bureau of Standards (1974). (AD 776 337)

Glass; silicon oxide; lithium niobate; calcite; potassium ortho-phosphate; thorium oxide; yttrium oxide; yttrium aluminate; laser damage; damage threshold; surface studies; optical properties; electrostriction

276. Felix, M. P., and Nachbar, W., "A Closer Look at Laser Damage in PMMA", Applied Physics Letters, 25 (1), 25-27 (July 1, 1974).

Polymers; polymethylmethacrylate; dielectric materials; laser damage; damage threshold; surface studies

277. Fox, J. A., "Effect of Pulse Shaping on Laser-Induced Spallation", Applied Physics Letters, 24 (7), 340-343 (April 1, 1974).

Aluminum alloys; 6061-T6; laser effect; spalling; surface studies

278. Fox, J. A., "Production of Stress Waves With Nano-Second Laser Pulses", Applied Optics, 13 (8), 1760-1762 (August 1974).

Aluminum alloys; 6061-T6; laser effect; stress-wave activity; surface studies

279. Fradin, D. W., Bass, M., Bua, D. P., et al., "Visible and Infrared Laser-Induced Damage to Transparent Materials", Final Report, AFCRL-TR-74-0082 Raytheon Company, Contract F 19(628)-73-C-0127 (January 1974). (AD 776 804)

Quartz; zinc selenide; alkali halides; laser damage; damage threshold; optical properties; surface studies; crystal structure

280. Hettche, L. R., "Thermomechanical Response of Materials to Pulsed Radiation Heating", Report NRL Progress, 11-20 (June 1974).

Unalloyed aluminum; aluminum alloys; 7075-T6; electron beam heating; laser effect; surface studies; melting; cracking; intergranular fracture; microstructure; spalling

281. Hoffman, C. G., "Laser-Target Interactions", Journal of Applied Physics, 45 (5), 2125-2128 (May 1974).

Gold coatings; titanium coatings; polyethylene; thin films; foil; wire; laser effect; surface studies; melting; holes; spalling; shock waves; cavitation; fracture

282. Iguchi, N., Oka, Y., and Saotome, Y., "Transformation Superplasticity in Pure Iron Under Rapid Heating", Nippon Kinzoku Gakkaishi, 38 (8), 725-730 (1974).

Iron; rapid heating; superplasticity; phase transformation; strain rate; grain size; microstructure

283. Ivasishin, O. M., Kononenko, V. L., Oshkaderov, S. P., et al., "Inheritance of Structure in High Speed Annealing of Deformed Carbon Steels", Metallofizika (Kiev), (53), 109-116 (1974).

Engineering steel; carbon steel; rapid heating; elevated temperature; deformation; microstructure

284. Kraatz, P., and Zoltai, T., "Effects of Ionizing Radiation on Cleavage on Surface Energy of SrF_2", Journal of Applied Physics, 45 (11), 5093-5095 (November 1974).

Strontium fluoride; laser window materials; radiation effect; microstructure; dislocations; cleavage; hardness; fracture

285. Kroger, F. A., and Marburger, J. H., "IR Window Studies", Quarterly Technical Report No. 7, AFCRL TR-74-0268, University of Southern California, Contract F 19(628)-72-C-0275 (March 1974). (AD 787 852)

Laser window materials; semiconductor materials; alkali halides; surface studies; infrared heating; rapid heating; mechanical properties; optical properties; thermal properties

286. Kroger, F. A., and Marburger, J. H., "IR Window Studies", Final Report AFCRL TR-74-0447, University of Southern California, Contract F 19(628)-72-C-0275 (September 1974). (AD A007 975)

Laser window materials; semiconductor materials; zinc selenide; potassium chloride; alkali halides; mechanical properties; thermal properties; refractive index; absorption

287. Larson, A. R., "Calculations of Laser-Induced Spall in Aluminum Targets", Informal Report LA-5619-MS, Los Alamos Scientific Laboratory, Contract W-7405-ENG-36 (December 1974).

Aluminum; 1100 aluminum; laser effect; spalling; stress; surface removal; absorption; surface studies

288. Leung, K. M., and DeShazer, L. G., "Surface Defects on Crystals of TiO_2 and YVO_4 Studied by Laser-Induced Damage Effects", National Bureau of Standards Special Publication 414, 193-199 (1974).

Titanium oxide; yttrium orthovanadate; single crystals; laser damage; surface studies; surface defects; damage threshold; crystal structure

289. Lipkin, J., "Dynamic Yield-Strength Determination at Elevated Temperatures After Nanosecond Pulse Heating", Experimental Mechanics, 14 (5), 177-183 (May 1974).

Aluminum alloys; 6061-T6; short time; rapid heating; elevated temperature; tensile yield strength; elastic-plastic stresses; spalling; fracture

290. Loomis, J. S., and Huguley, C. A., "Laser Window Damage From CW 10.6 Micrometers Radiation", National Bureau of Standards Special Publication 414, 94-102 (1974).

Potassium chloride; sodium chloride; zinc selenide; laser damage; surface studies; optical properties; distortion

291. Matsuoka, Y., and Usami, A., "Laser Damage to Copper-Doped and Undoped Silicon Solar Cells", Journal of Physics D, 7 (9), 1259-1269 (1974).

Silicon; solar cells; copper addition; laser damage; surface studies; melting; cracking; degradation; photoelectric properties

292. McLellan, D. L., "Laser-Heating-Induced Failure of Metal Alloys Under Constant Stress", Journal of Testing and Evaluation, 2 (6), 463-470 (November 1974). (AD 100 180)

Aluminum alloys; 2024-T81; 2024-T3; titanium alloys; Ti-6Al-4V; stainless steel; AISI 301; laser effect; rapid heating; stress intensity; fracture; creep rupture strength; ultimate tensile strength

293. Ming, L-C., and Bassett, W. A., "Laser Heating in the Diamond Anvil Press up to 2000 C Sustained and 3000 C Pulsed at Pressures up to 260 Kilobars", Review of Scientific Instruments, 45 (9), 1115-1118 (September 1974).

Graphite; diamond; laser heating; material processing; phase transformation

294. Neiberlein, V. A., "Laser Damage Predictions for Aluminum and Stainless Steel Plate", Technical Report RR-74-7, Redstone Arsenal, Contract DA-1-T-662609-A-308 (May 15, 1974). (AD/A 016 121)

Unalloyed aluminum; stainless steel; laser damage; computer programming; surface studies; burn-through data; thickness; time

295. Orlich, J., "Description of the Austenitization Events in the Rapid Heating of Steel by Time-Temperature-Austenitization Diagrams", Harterei-Technische Mitteilungen, 29 (4), 231-236 (1974).

Engineering steel; rapid heating; phase transformation; grain growth; microstructure; TTT diagrams

296. Pitha, C. A., Armington, A., and Posen, H., "Conference on High Power Infrared Laser Window Materials (3rd), November 12-14, 1974. Volume III. Surfaces, Coatings", Special Report AFCRL TR-74-0085-VOL-3 (February 1974). (AD 918 232L)

Dielectric materials; alkali halides; potassium chloride; sodium chloride; zinc selenide; cadmium telluride; gallium arsenide; laser damage; surface studies; surface damage; bulk damage

297. Posen, H., Bruce, J., and Milan, D., "10.6 Micrometers Pulsed Laser Damage in ZnSe", National Bureau of Standards Special Publication 414, 85-92 (1974).

Zinc selenide; laser damage; crystal structure; twinning

298. Saito, T. T., Charlton, G. B., and Loomis, J. S., "The 10.6 Micrometer CW (Continuous Wave) Laser Damage Studies of Metal Substrate Mirrors", National Bureau of Standards Special Publication 414, 103-112 (1974).

Mirrors; dielectric coatings; laser damage; damage threshold; surface studies

299. Schmidt, R. M., and Shrader, J. F., "Response of Magnesium, Aluminum and Stainless Steel to Impact Loading and Electron Beam Irradiation", Final Report T2-4102-1, The Boeing Aerospace Company, Contract F 04(701)-72-C-0210 (July 1974). (AD 922 618L)

Magnesium alloys; AZ31; aluminum alloys; 2024-T6; stainless steel; AISI 304; electron-beam heating; rapid heating; short time; elevated temperature; surface studies; viscoelasticity; spalling; density; modulus of elasticity; Poisson's ratio; shear modulus; ultimate tensile strength

300. Schuldies, J. J., "Surface Evaluation Using Acoustic Emission -- Crack Initiation in Silicon Nitride by Laser Thermal Shocking", Fracture Mechanics of Ceramics, Proceedings of the Symposium, Volume 1, University Park, Pennsylvania, July 11-13, 1973, Plenum Press, New York (1974), pp 189-200.

Silicon nitrides; laser effect; heating; crack propagation; notch sensitivity; surface studies; acoustic emission technique; thermal shock; bend properties; fatigue properties; fracture toughness; destructive test

301. Stark, E. E., Jr., and Reichelt, W. H., "Damage Thresholds in ZnSe, A/R (Antireflection) Coated NaCl and Micromachined Mirrors by 10.6 Micrometers Multijoule, Nanosecond Pulses", National Bureau of Standards Special Publication 414, 53-58 (1974).

Zinc selenide; sodium chloride; mirrors; laser damage; damage threshold; surface studies

302. Walton, J. D., Jr., "Reaction Sintered Silicon Nitride for High Temperature Radome Applications", American Ceramic Society Bulletin, 53 (3), 255-258 (March 1974).

Silicon nitride; ceramic materials; radomes; thermal shock; dielectric properties; flexure strength; modulus of elasticity; Poisson's ratio; thermal conductivity; thermal expansion; specific heat; density

303. Wang, V., Rudisill, J. E., Giuliano, C. R., et al., "Pulsed CO_2 Laser Damage in Windows, Reflectors and Coatings", National Bureau of Standards Special Publication 414, 59-65 (1974).

Thin films; zinc selenide coatings; arsenic selenide coatings; thorium fluoride coatings; potassium chloride substrates; copper; laser damage; damage threshold; surface studies; absorption

304. Wilcox, W. W., "Effects of Enhanced Laser-Induced Stress Waves in Thin Aluminum Sheets", Technical Report UCID-16617, California University, Contract W-7405-Eng-48 (November 6, 1974). (N75-20710)

Aluminum; laser effect; spalling; deformation; failure; microstructure

1975

305. Apollonov, V. V., Barchukov, N. V., Karlov, N. V., et al., "Thermal Action of High-Power Laser Radiation on the Surface of a Solid", Soviet Journal of Quantum Electronics, 5 (2), 216-221 (August 1975).

Gold coatings; quartz substrates; aluminum; nickel; copper; tungsten; laser effect; thermal stress; surface studies; spalling; melting; plastic deformation; residual stresses

306. Baranov, M. S., Vershck, B. A., and Geynrikhs, I. N., "Determination of the Depth of the Melting Zone During Laser Radiation of Metal", Teplofizika Vysokikh Temperatur, 13 (3), 566-572 (1975).

Tin; zinc; nickel; titanium; laser effect; surface studies; melting; cratering; penetration depth

307. Bechtel, J. H., "Heating of Solid Targets With Laser Pulses", Journal of Applied Physics, 46, 1587-1593 (April 1975).

Tungsten; laser effect; surface studies; penetration depth; absorption; time

308. Brewer, W. D., "Interaction of Graphite and Ablative Materials With CO_2-Laser, Carbon-Arc, and Xenon-Arc Radiation", Thesis, NASA TM-X-68726, George Washington University (May 1975). (N75-22385)

Graphite; carbon/resin composite; nylon; laser effect; cavitation; cracking; spalling; bending; degradation; surface studies

309. Dickinson, S. K., "Infrared Laser Window Materials Property Data for Zinc Selenide, Potassium Chloride, Sodium Chloride, Calcium Fluoride, Strontium Fluoride, Barium Fluoride", Technical Report AFCRL TR-75-0138 (June 1975). (AD/B 007 119L)

Zinc selenide; potassium chloride; sodium chloride; calcium fluoride; strontium fluoride; barium fluoride; laser damage; surface studies; melting; absorption; refractive index; thermal stability

310. Fox, J. A., and Barr, D. N., "The Effect of Short-Pulse Laser Radiation on Coatings", Technical Report USAMERDC-2138, Army Mobility Equipment Research and Development Center (April 1975). (AD/A 018 864).

Paint coatings; distilled water coatings; aluminum substrates; tin substrates; lead substrates; Plexiglas substrates; laser effect; laser damage; surface removal; vaporization; spalling; perforations; stress-wave activity; reflectivity; shock waves; surface studies

311. Ghez, R. A., "Laser Heating and Melting of Thin Films on Low-Conductivity Substrates", Journal of Applied Physics, 46 (5), 2103-2110 (May 1975).

Thin films; silicon; laser effect; surface studies; heating; melting

312. Goldin, V. Ya., and Chetverushkin, B. N., "Investigation of the Cooling and Fragmentation of a Spherical Target Heated by Laser Radiation", Zhurnal Eksperimentalnoy i Teoreticheskoy Fiziki, 68 (5), 1768-1771 (1975).

Polyethylene; laser effect; shock waves; explosive test; destructive test

313. Hibben, S. G., Kourilo, J., Ness, M., and Shresta, B., "Effects of High Power Lasers", Interim Report No. 6, Informatics Incorporated, Contract MDA93-76-C-0099 (November 12, 1975).

Titanium; laser effect; cratering; surface studies

Armco iron; engineering steel; ShKh-15; laser effect; erosion; surface studies

Engineering steel; iron alloys; aluminum; titanium; copper; laser effect; cratering; surface studies

Iron alloys; cast iron; laser effect; hardening; durability; wear; microstructure

Nickel oxide coatings; copper oxide coatings; cobalt oxide coatings; iron oxide coatings; laser effect; burn-through data; holes; surface studies

Carbides; laser effect; erosion; weight change; surface studies

Aluminum; laser effect; vaporization; surface studies

Molybdenum; laser effect; dislocations; microstructure

314. Johnson, R. L., and O'Keefe, J. D., "Aerodynamic Enhancement Study", Final Report AT-SVD-TR-75-7, TRW Systems Group, Contract N00014-75-C-0082 (June 20, 1975). (AD/B 004 917L)

Aluminum; titanium; stainless steel; laser damage; burn-through data; viscosity; thickness; compressive properties

315. Kibler, K. G., Carter, H. G., and Eisenmann, J. R., "Residual Strength of Laser-Damaged Graphite Composites", Journal of Composite Materials, 9 28-32 (January 1975).

Fiber reinforced composites; resin matrix composites; carbon/resin composite; graphite/epoxy composite; laser damage; penetration depth; residual stresses; mechanical properties; fracture toughness; melting; vaporization

316. Klass, P. J., "Special Report: Laser Weapons. Advanced Weaponry Research Intensifies", Aviation Week & Space Technology, 103, 34-39 (August 18, 1975).

Aluminum oxide; laser damage; vaporization; absorption; thermal properties; thermal coupling; review; no data

317. Kovalev, V. I., Morozov, V. V., Sagitov, S. I., et al., "Strength of Gold Coatings in (Laser) Beams", Kvantovaya Elektronika (Moscow), 2 (7), 1527-1535 (1975).

Gold coatings; copper substrates; nickel substrates; titanium substrates; glass substrates; laser damage; damage threshold; thickness; ultimate tensile strength; mechanical properties; reflectivity; optical properties

318. Kozlova, N. N., Petrukhin, A. I., and Sulyaev, V. A., "Experimental Investigation of the Onset of Evaporation and Formation of a Plasma Layer Due to Interaction Between Laser Radiation and Metals in Different Gases", Soviet Journal of Quantum Electronics, 5 (7), 747-749 (1975).

Aluminum; bismuth; laser effect; evaporation; shock waves; surface studies

319. Lokhov, Yu. N., Mospanov, V. S., and Fiveiskii, Yu. D., "Evaporation and Damage of Entry and Exit Faces of a Transparent Solid Dielectric by a Giant Laser Pulse", Soviet Journal of Quantum Electronics, 5 (5), 488-490 (1975).

Dielectric materials; sapphire; laser damage; melting; cratering; cracking; spalling; absorption; evaporation; damage threshold; thermal stress; surface studies

320. Magee, T. J., "Laser Damage Phenomena in Materials", Interim Report AFOSR TR-75-0389, Stanford Research Institute, Contract AFOSR F 44(620)-73-C-0019 (February 1975). (AD/A 008 879)

Thin films; zinc selenide; potassium chloride; cadmium telluride; aluminum; coatings; laser damage; microstructure; defects; damage threshold; defects; absorption; dislocations; stacking faults

321. Mandl, A., "Aerodynamic Enhancement of Laser Damage to Titanium Alloys", Final Technical Report AFML-TR-75-26, Contract F 33(615)-73-C-5158 (May 1975). (AD/B 011 425L)

Titanium alloys; Ti-8Mn; Ti-6Al-4V; Ti-12Mo-6Zr-5N; laser damage; surface studies; melting; surface removal; weight change; burn-through data

322. Marcus, S., and Lowder, J. E., "Impulsive Loading of Targets by HF Laser Pulses", Journal of Applied Physics, 46 (5), 2293-2294 (May 1975).

Aluminum; laser effect; surface studies; absorption

323. McMordie, J. A., and Roberts, P. D., "Interaction of Pulsed CO_2 Laser Radiation With Aluminum", Journal of Physics D (Applied Physics), 8 (7), 768-781 (May 11, 1975).

Aluminum alloys; laser effect; surface studies; refractive index; modeling; computer program

324. Metz, S. A., Hettche, L. R., Stegman, R. L., and Schriempf, J. R., "Effect of Beam Intensity on Target Response to High-Intensity Pulsed CO_2 Laser Radiation", Journal of Applied Physics, 46 (4), 1634-1642 (April 1975).

Stainless steel; aluminum oxide; magnesium oxide; graphite; fiberglass; Lucite; ceramic materials; aluminum; laser effect; thermal response; thermal coupling; vaporization; absorption; surface studies

325. Moisa, M. I., "Corrosion Resistance of Steel 40Kh After Laser Treatment", Soviet Materials Science, 10 (1), 89-90 (January-February 1975).

Engineering steel; 40Kh; laser effect; surface studies; melting; cracking; weight change; corrosion

326. Moynihan, C. T., Macedo, P. B., Danielson, P. B., and Elterman, P. B., "Laser Hardened Chalcogenide Glass Infrared Windows", Technical Report No. 33, Catholic University of America, Contract N00014-67-A-0377-0028 (September 1975).

Infrared windows; chalcogenide glasses; laser effect; thermal shock; shock hardening; absorption; thermal expansion; failure

327. Murr, L. E., and Szilva, W. A., "Laser-Induced Fracture in Silicon", Journal of Materials Science, 10, 1536-1548 (1975).

Silicon; single crystals; laser effect; fracture; flaws; burn-through data; compressive stress; cleavage; cracking; microstructure; dislocations; stacking faults

328. Payne, D. A., and Ham, I., "Microhardness of Laser Treated Carbide Coatings on Metal Cutting Tools", Wear, 33, 377-379 (1975).

Tungsten carbides; carbide coatings; cutting tools; laser effect; microstructure; microhardness; interfaces; wear

329. Porteus, J. O., Soileau, M. J., Bennett, H. E., et al., "Laser Damage Measurements at Carbon Dioxide and Deuterium Fluoride Wavelengths", Technical Report NWC-TP-5810, Naval Weapons Center (November 1975). (AD/A 017 951)

Mirrors; aluminum alloys; 2024; aluminum coatings; quartz substrates; aluminum substrates; laser damage; damage threshold; surface studies; melting; pitting; cratering

330. Rykalin, N. N., Uglov, A. A., and Kokora, A. N., "Influence of a High-Power CO_2 Laser Beam on Iron and Its Alloys", Translation DRIC-TRANS-4117, DRIC-BR-45195, Defence Research Information Centre (England) (July 1975). (AD/A 014 565)

Iron; iron alloys; Armco iron; engineering steel; ST-45; U-8; KhVG; laser effect; heating; thermal properties; chemical properties; oxidation; mass transfer; degradation

331. Walters, C. T., Beverly, R. E., III, and Negrelli, T. J., "Exploratory Development of Laser-Hardened Materials and Measurement of Laser Beam Parameters and Material Response to High-Power Radiation. Volume I", Technical Report AFML TR-75-183-VOL-1, Battelle-Columbus Laboratories, Contract F 33(615)-73-C-5045 (December 1975). (AD/A 026 831)

Cadmium telluride; sodium chloride; aluminum oxide; titanium alloys; Ti-6Al-4V; laser effect; absorption; reflectivity; distortion; surface studies; burn-through data; thermal response

332. Willis, L. J., and Emmony, D. C., "Laser Damage in Germanium", Optical Laser Technology, 7 (5), 222-228 (1975).

Germanium; single crystals; mirrors; germanium coatings; glass substrates; silicon; laser damage; surface studies; melting; surface defects; cavitation

333. Zakharov, S. I., Lokhov, I. N., Fieveiskii, I. D., and Iampolskii, P. A., "Fission Rupture Mechanism of the Surface of Optically Transparent Dielectrics by a Focused Monopulse Laser", Translation of Zhurnal Prikladnoy Spektroskopii (USSR), 23 (2), 313-316 (1975).

Dielectric materials; laser effect; stress analysis; elastic properties; fracture; surface studies

1976

334. Arushanov, S. Z., Bebchuk, A. S., and Lomonosov, V. V., "Anisotropy of the Threshold of Optical Strength of Alkali Halide Single Crystals During Damage by Polarized Laser Radiation", Fizika Tverdogo Tela (Leningrad), 18 (5), 1442-1445 (1976).

Alkali halides; potassium bromide; lithium fluoride; single crystals; laser damage; crystal orientation; optical properties

335. Bettis, J. R., "Laser-Induced Damage as a Function of Dielectric Properties at 1.06 Micrometers", Technical Report AFWL-TR-76-61, Final Report, Air Force Weapons Laboratory (July 1976).

Dielectric materials; optical materials; glass; fused silica; fluorides; halides; thin films; coatings; laser damage; damage threshold; surface studies; surface roughness; refractive index

336. Blaszuk, P. R., Hulse, C. O., Waters, J. P., et al., "Exposure Damage Mechanisms for KCl Windows in High Power Laser Systems", Final Report, NASA CR-134982, United Technologies Research Center, Contract NAS 3-18928 (March 15, 1976). (AD/D 108 533)

Laser window materials; potassium chloride; laser damage; optical properties; creep rupture strength

337. Brodin, M. S., Davydova, N. A., and Shablii, I. Yu., "Action of Laser Radiation on the Optical Spectra of Cadmium Sulfide Single Crystals", Fizika i Tekhnika Poluprovodnikov, 10 (4), 625-630 (1976).

Cadmium sulfide; single crystals; laser effect; optical properties; low temperature

338. Chang, C. C., Ho, W. C., and Chan, Y. W., "Effect of Laser Pulse Irradiation on the Critical Temperature of $Ti_{0.8}Nb_{0.2}$ Alloy and Niobium", Cryogenics, 16 (7), 433-435 (July 1976).

Titanium alloys; niobium addition; niobium; thin films; foils; laser effect; heating; annealing; superconductivity; phase transformation; transition temperature

339. Clauer, A. H., Fairand, B. P., and Wilcox, B. A., "Pulsed Laser-Induced Deformation in an Fe-3Si Alloy", Manuscript submitted for publication in Metallurgical Transactions (April 20, 1976).

Iron alloys; Fe-3Si; laser effect; plastic deformation; shock hardening; stress waves; microstructure; twinning; slip

340. Danileiko, Yu. K., Manenkov, A. A., and Nechitailo, V. S., "Subthreshold Effects During the Laser Damaging of Optical Materials", Kvantovaya Elektronika, 3 (2), 438-441 (1976).

Optical materials; sapphire; glass; laser damage; surface damage; bulk damage

341. Fairand, B. P., and Clauer, A. H., "Effect of Water and Paint Coatings on the Magnitude of Laser-Generated Shocks", Manuscript submitted for publication in Optics Communcations (April 19, 1976).

Aluminum; zinc; foils; water coatings; paint coatings; laser effect; absorption; surface studies

342. Geptin, A. P., Larina, R. R., and Mirkin, L. I., "Features of the Dislocation Structure of Zinc Emerging During Laser Beam Action", Izvestia VUZ Fiziki, 19 (4), 26-30 (1976).

Zinc; laser effect; microstructure; dislocations; plastic deformation; slip

343. Gokcen, N. A., Chang, E. T., Poston, T. M., et al., "Determination of Graphite-Liquid-Vapor Triple Point by Laser Heating", Technical Report SAMSO TR-76-29, Aerospace Company, Contract F 04(701)-75-C-0076 (January 30, 1976). (AD/A 021 168)

Graphite; laser effect; cratering; cavitation; surface studies; absorption; phase diagram; microstructure

344. Gorshkov, B. G., Denileiko, Yu. K., Epifanov, A. S., et al., "On the Mechanism of Laser-Induced Fracture of Alkali Halide Crystals: Study of the Temperature Dependence of Fracture Thresholds", Pis'ma Zhurnal Tekhnicheskoy Fiziki, 2 (6), 284-287 (1976).

Alkali halides; sodium chloride; potassium bromide; potassium chloride; sodium fluoride; lithium fluoride; laser damage; damage threshold; fracture; temperature effect; surface studies

345. Gridin, V. A., Krotov, V. A., and Petrovskii, A. N., "Damage of KDP (Potassium Dihydrogen Phosphate) Crystals by Ultrashort Laser Pulses", Kvantovaya Elektronika, 3 (2), 311-315 (1976).

Potassium dihydrogen phosphate; laser damage; damage threshold; surface studies

346. Harrigan, W. C., Jr., "Analysis of Elevated-Temperature Impact Fractures of Graphite-Reinforced Aluminum Composites", Technical Report, Aerospace Corporation (no date given-received March 15, 1976).

Fiber reinforced composites; graphite/Al composite; metal matrix composites; aluminum alloys; casting alloys; rapid heating; short time; elevated temperature; impact test; fracture surface; flexure strength; microstructure

347. Harth, G. H., Leslie, W. C., Gregson, V. G., et al., "Laser Heat Treating of Steel", Journal of Metals, 28 (4), 5-11 (April 1976).

Engineering steel; AISI 1045; Armco iron; manganese phosphate coatings; laser effect; surface studies; cracking; reflectivity; absorption; mictostructure; phase transformation

348. Hettche, L. R., Tucker, T. R., Schriempf, J. T., et al., "Mechanical Response and Thermal Coupling of Metallic Targets to High-Intensity 1.06-u Laser Radiation", Journal of Applied Physics, 47 (4), 1415-1421 (April 1976).

Aluminum; titanium alloys; Ti-6Al-4V; laser effect; damage threshold; absorption; thermal coupling

349. Kruer, M., Esterowitz, L., Allen, R., et al., "Thermal Models for Laser Damage in Indium Antimonide Photovoltaic and Photoconductive Detectors", Infrared Physics, 16 (3), 375-384 (1976).

Indium antimonide; laser damage; damage threshold; thermal properties

350. Leung, K. M., Tang, C. C., and DeShazer, L. G., "Laser Damage of Cadmium Sulfide and Zinc Sulfide Thin Films", Thin Solid Films, 34 (1), 119-123 (1976).

Cadmium sulfide; zinc sulfide; thin films; coatings; laser damage; damage threshold; absorption; optical properties; surface studies

351. Magee, T. J., "Studies of Laser Damage Phenomena in Materials", Interim Report AFOSR TR-76-0157, Stanford Research Institute, Contract F 44(620)-73-C-0019 (January 15, 1976). (AD/A 023 269)

Potassium chloride; zinc selenide; aluminum; alkali halides; laser damage; surface studies; absorption; microstructure; dislocations; stacking faults; precipitation

352. Marcus, S., Lowder, J. E., Manlief, S. K., et al., "Laser Heating of Metallic Surfaces", Technical Report ESD-TR-76-122, Massachusetts Institute of Technology, Contract F 19(628)-76-C-0002 (May 20, 1976). (AD/A 028 580)

Aluminum; copper; titanium; laser effect; surface studies; thermal coupling; absorption; damage threshold

353. Matsuoka, Y., "Laser-Induced Damage to Semiconductors", Journal of Physics D, 9 (2), 215-224 (1976).

Semiconductors; silicon; laser damage; damage threshold; surface studies; cracking; thermal stress

354. Mirkin, L. I., "Physical Principles of the Treatment of Materials by Laser Beams (Chapters 2 and 8)", Machine translation FTD-ID (RS)T-2401-75 of Fizicheskiye Osnovy Obrabotki Materialov Luchami Lazers. Izd-vo Moskovskogo Universiteta (USSR), 25-62, 267-320, 1975 (January 1976). (AD/B 009 059L)

Copper alloys; tungsten carbide; aluminum; bismuth; iron; graphite; polymethylmethacrylate; surface studies; melting; cratering; microstructure; dislocations; fracture

355. Nebolsine, P. E., "Laser Simulation of Hypervelocity Impact -- on Nose-Tip Materials", American Institute of Aeronautics and Astronautics, 14th Aerospace Sciences Meeting, Washington, D.C., AIAA Paper 76-52 (January 26-28, 1976).

Graphite; brittle materials; laser effect; heating; impact properties; cratering; erosion resistance; particle size distribution

356. Smith, W. L., Bechtel, J. H., and Bloembergen, N., "Dielectric Breakdown Induced by Picosecond Laser Pulses", Technical Report TR-665, Harvard University, Contracts N00014-75-C-0648 and F 44(620)-75-C-0088 (October 1976). (AD/A 031 852)

Alkali halides; quartz; sapphire; calcium fluoride; glass; aluminum oxide; potassium chloride; lithium fluoride; laser effect; damage threshold; refractive index; surface studies; bulk damage; dielectric properties

357. Tews, P., Pence, P., Sanders, J., et al., "Electron Beam Welding Spike Suppression Using Feedback Control", Welding Journal, 55 (2), 52s-55s (February 1976).

Aluminum alloys; 7075-T6; electron beam welding; weld defects; short time; depth of penetration; microstructure

358. Tovstyuk, K. D., Plyatsko, G. V., Nikonyuk, E. S., et al., "Features of the Interaction of Intensive Laser Radiation With Cadmium Telluride Single Crystals Doped With Bromine and Germanium", Ukrainskiy Fizicheskiy Zhurnal, 21 (4), 689-691 (1976).

Cadmium telluride; single crystals; bromine addition; germanium addition; laser effect; surface studies; recrystallization

359. Whittaker, A. G., Kintner, P. L., Nelson, L. S., et al., "A System Employing Laser Heating for the Measurement of High-Temperature Properties of Materials Over a Wide Pressure Range", Technical Report SAMSO TR-76-133, Aerospace Corporation, Contract F 04(701)-75-C-0076 (July 7, 1976). (AD/A 029 459)

Refractory materials; laser heating; physical properties; surface studies; phase studies

AUTHOR INDEX

Aboelfotoh, M. O., 145
Abrams, L. A., 13
Agranat, M. B., 76, 100, 101
Akimov, A. I., 64
Akulenok, E. M., 146
Allingham, C. O., 203
Alyassini, N., 204
Ammann, E. O., 205
Anderholm, N. C., 147
Anisimov, S. I., 44
Apollonov, V. V., 305
Arkhipov, Yu. V., 148
Arushanov, S. Z., 334
Ashton, R. F., 65
Austin, C. W., Jr., 206
Austin, R. R., 149, 207
Aver'yanova, T. M., 35
Avotin, S. S., 150
Axelrad, D. R., 66

Babcock, S. G., 45, 54, 77, 78, 79, 102, 208
Baranov, M. S., 306
Barchukov, A. I., 67
Barenblatt, G. I., 46
Barnett, C.W.H., 22
Barsanti, G., 209
Basharov, R., 68
Basov, N. G., 103
Bass, M., 151, 210, 211
Bates, R. D., Jr., 152
Bechtel, J. H., 307
Bedilov, M. R., 153
Belozerov, S. A., 154
Belyaev, L. M., 212, 265
Belyanin, V. A., 47
Bendix Corporation, 30
Bennett, H. S., 104
Bennett, J. M., 266
Bernett, E. C., 16
Bertolotti, M., 155
Bettis, J. R., 335
Blaszuk, P. R., 336
Bliss, E. S., 156, 213
Bloembergen, N., 214
Boeing Company, 80
Boling, N. L., 157, 158, 215, 216, 217, 267
Bonch-Bruevich, A. M., 81
Bond, J. W., Jr., 218
Boyko, Yu. I., 105, 106
Bramer, J. A., 82
Braunlich, P. F., 219
Braunstein, A. I., 220
Brewer, W. D., 308
Brodin, M. S., 36, 337
Bua, D., 268
Burdin, V. V., 221
Burenkov, G. L., 222
Butler, C. T., 269

Cervay, R. R., 159
Chang, C. C., 338
Chernenko, V. S., 107
Childers, K., 270
Clapper, R. B., 17
Clauer, A. H., 339
Condell, W. J., 160
Cross, H. C., 1
Cutter, M. A., 271

Danileiko, Yu. K., 83, 340
Davydov, V. G., 84
Dedman, H., 18
Deming, J. L., 85
DeShazer, L. G., 108, 223
Diaconis, N. S., 109
Dickinson, S. K., 309
Doering, H., 32
Dotson, C. L., 7
Drachinskii, A. S., 272

Edwards, D. F., 161
Eleiche, A.S.M., 162
Engquist, R. D., 69
Eremchenko, D. V., 86
Ermatov, S. E., 87

Fabelinskii, I. L., 88
Fairand, B. P., 163, 273, 341
Fedotov, S. G., 89
Feldman, A., 164, 224, 225, 274, 275
Felix, M. P., 276
Fenn, R. W., Jr., 23
Fersman, I. A., 90, 110
Feuerstein, W. J., 5
Field, J. E., 165
Fox, J. A., 226, 277, 278, 310
Fradin, D. W., 166, 227, 228, 229, 279
Frisch, J., 33

General Electric Company, 144
Geptin, A. P., 342
Gerstle, J. H., 230
Ghez, R. A., 311
Gilbert, K. G., 167

PRECEDING PAGE BLANK-NOT FILMED

Giuliano, C. R., 168, 169, 170, 231, 232
Glass, A. J., 233, 234
Glikman, L. A., 55
Gokcen, N. A., 343
Goldin, V. Ya., 312
Golubets, V. M., 171
Gordienko, A. I., 111
Gorshkov, B. G., 344
Grasyuk, A. Z., 70
Gregg, D. W., 39
Gridin, V. A., 345
Gridnev, V. N., 172, 235
Griffin, R. B., 173
Grigoriew, H., 174
Gronvold, W., 19
Gryaznov, I. M., 175
Gulyaeva, A. S., 176, 236
Gurevich, G. L., 237

Harrigan, W. C., Jr., 346
Harth, G. H., 347
Hauser, D., 112, 113
Heimerl, G. J., 8, 9
Hettche, L. R., 280, 348
Hibben, S. G., 114, 313
Hoffman, C. A., 238
Hoffman, C. G., 281
Honeycutt, J. H., 71, 91, 239
Howard, J. K., 177
Hsu, T. R., 240

Iguchi, N., 282
Il'ina, K. N., 115
Ivasishin, O. M., 283
Ives, J. S., Jr., 24

Jerusalimskaya, A. N., 56
Johnson, C. R., 92
Johnson, R. L., 314

Kaporsky, L. N., 57
Karasev. I. G., 116
Kattus, J. R., 12, 20, 25
Kazakevich, V. I., 72, 117
Kembry, K., 178
Kibler, K. G., 315
Kidin, I. N., 58, 118, 119
Kiesling, W., Jr., 120
Klass, P. J., 316
Knight, J. P., 29
Komotskii, V. A., 121
Korchynsky, M., 21
Korunchikov, A. I., 93
Kovalev, V. I., 317
Kozlova, N. N., 318

Kraatz, P., 284
Krishtal, M. A., 241
Kroger, F. A., 242, 285, 286
Kruer, M., 349
Kulyapin, V. M., 122

Larson, A. R., 287
Leung, K. M., 288, 350
Levinson, G. R., 123
Levitt, A. P., 26
Lipkin, J., 179, 243, 289
Lisitsa, M. P., 244
Litvinov, V. S., 180
Lokhov, Yu. N., 124, 319
Loomis, J. S., 290
Lumley, R. M., 73

Magee, T. J., 320, 351
Mandl, A., 321
Marcus, S., 322, 352
Matsuoka, Y., 291, 353
Metz, S. A., 324
Mezokh, Z. I., 125, 246
Milam, D., 247
Ming, L-C., 293
Mirkin, L. I., 40, 48, 126, 248, 354
Moisa, M. I., 325
Mollica, R. J., 14
Morrison, J. D., 11
Moynihan, C. T., 326
Murphy, J., 41
Murr, L. E., 249, 327
Myers, J. D., 34

McKnight, H. G., 245
McLellan, D. L., 292
McMordie, J. A., 323

Nebolsine, P. E., 355
Neiberlein, V. A., 294
Nesterov, L. A., 94
Neuroth, N., 127
Newman, R. L., 181
Ng, R., 182
Novikov, N. P., 49, 250

O,Keefe, J. D., 251
Orekhov, M. E., 183
Orlich, J., 295
Orlov, A. A., 184, 252

Panteleev, V. V., 74
Payne, D. A., 328
Pedanov, V. V., 59
Perry, F. C., 95

Peterson, G. E., 253
Petukhova, T. M., 128, 185
Pitha, C. A., 186, 187, 296
Porteus, J. O., 329
Posen, H., 297
Poulsen, P. D., 188
Preston, J. B., 15, 27

Ready, J. F., 129
Rikman, E. P., 60
Romanov, G. S., 130
Rudenko, V. N., 42
Rykalin, N. N., 189, 330

Saito, T. T., 298
Sam, C. L., 254
Sanders, W. A., 190
Schastlivtsev, V. M., 191
Schilberg, L. E., 50
Schmidt, R. M., 299
Schuldies, J. J., 300
Sessler, J., 43
Shiozawa, L. R., 131
Simmons, W. F., 2
Smith, D. M., 192
Smith, J. L., 193
Smith, W. K., 4
Smith, W. L., 356
Stark, E. E., Jr., 301
Stefansky, T., 132, 133, 134
Stegman, R. L., 255
Steinberg, G. N., 31, 37
Stocking, B., 194
Sultanov, M. A., 135
Suminov, V. M., 195

Tang, C. L., 61
Tews, P., 357
Torvik, P. J., 256
Tovstyuk, K. D., 358
Triebes, K., 136
Trink, S., 137, 196, 197
Turner, A. F., 138

Uglov, A. A., 198
Urazaliev, U. S., 257

Van Echo, J. A., 3, 6, 10
Veiko, V. P., 62
Vladimirov, V. I., 51
Vogel, K., 38
Volkova, N. V., 52
Volodkina, V. L., 258
Voropay, Y. S., 139

Walters, C. T., 331
Walton, J. D., Jr., 302
Wang, V., 259, 303
Wendlandt, B.C.H., 260
Whittaker, A. G., 199, 359
Wieting, T. J., 200
Wilcox, W. W., 304
Willhelm, A. C., 28
Willis, L. J., 332
Wood, R. M., 140

Yefimenko, Yu. M., 63

Zakharov, S. I., 333
Zakharov, V. P., 141
Zeldovich, Y. B., 96, 261
Zhirovetsky, V. M., 201
Zhiryakov, B. M., 97, 142
Zhukov, A. A., 143

SUBJECT INDEX

SURFACE EFFECTS

ALKALI HALIDES

Alkali Halides (general)–105, 129, 166, 186, 189, 210, 214, 229, 242, 244, 265, 269, 279, 285, 286, 296, 334, 335, 344, 351, 356

ALUMINATES

Magnesium Aluminate–223

Yttrium Aluminate–275

ALUMINIDES

Nickel Aluminide–180

ALUMINUM AND ALUMINUM ALLOYS

Aluminum (unalloyed)–30, 38, 39, 64, 69, 81, 93, 114, 116, 121, 123, 129, 130, 145, 202, 218, 258, 271, 280, 287, 294, 304, 305, 310, 313, 318, 322, 324, 329, 348, 351, 352, 354

Aluminum Alloys (general)–74, 99, 122, 200, 323

Duralumin–35, 44

1100–287

2024–182, 255, 256, 299, 329

6061–226, 270, 277, 278

7075–43, 280

ARSENIDES

Gallium Arsenide–70, 176, 193, 242, 254, 296

Indium Arsenide–30

BERYLLIUM AND BERYLLIUM ALLOYS

Beryllium (unalloyed)–38, 39, 249

BISMUTH

Bismuth–318, 354

BROMIDES

Potassium Bromide–105, 244, 269, 334, 344

CADMIUM AND CADMIUM ALLOYS

Cadmium (unalloyed)–53

CALCIUM COMPOUNDS

Calcite (Calcium Carbonate)–225, 245, 275

CARBIDES

Carbides (general)–313

Tungsten Carbide–248, 354

PRECEDING PAGE BLANK-NOT FILMED

CARBON/GRAPHITE

Carbon–39, 74, 93, 96, 129, 165

Graphite–44, 109, 255, 270, 308, 324, 343, 354, 355

CERAMIC MATERIALS

Ceramic Materials (general)–181, 255, 260, 324

CHALCOGENIDES

Chalcogenides (general)–186, 187, 214, 274

Arsenic Selenide–259, 303

Cadmium Selenide–70

Cadmium Telluride–186, 187, 214, 220, 259, 296, 331, 358

Zinc Selenide–186, 187, 214, 220, 274, 279, 286, 290, 296, 301, 303, 309, 351

Zinc Telluride–254, 259

CHLORIDES

Potassium Chloride–105, 186, 187, 220, 244, 259, 269, 274, 286, 290, 296, 303, 309, 336, 344, 351, 356

Rubidium Chloride–210

Sodium Chloride–105, 108, 178, 210, 219, 223, 229, 244, 290, 296, 301, 309, 331, 344

CHROMIUM AND CHROMIUM ALLOYS

Chromium (unalloyed)–30, 123, 202, 258

COBALT AND COBALT ALLOYS

HS21–34

COMPOSITES

Carbon/Resin Composite–308

Fiberglas/Epoxy Composite–255

COPPER AND COPPER ALLOYS

Copper (unalloyed)–34, 38, 41, 42, 44, 53, 64, 69, 93, 114, 116, 123, 129, 202, 291, 303, 305, 313, 317, 352

Copper Alloys (general)–74, 99, 248, 354

Brass–44, 114, 129

Cu-15Pt–248

DIELECTRIC MATERIALS

Dielectric Materials (general)–31, 37, 108, 110, 114, 151, 154, 156, 158, 169, 170, 211, 213, 214, 215, 216, 219, 223, 234, 244, 247, 250, 259, 276, 296, 298, 319, 333, 335

FLUORIDES

Fluorides (general)–335

Barium Fluoride–220, 309

Calcium Fluoride–138, 309, 356

Cryolite–114

Lithium Fluoride–52, 138, 219, 334, 344, 356

Magnesium Fluoride–37, 108, 114, 138, 140, 207, 223

Sodium Fluoride–210, 229, 344

Strontium Fluoride–284, 309

Thorium Fluoride–37, 108, 138, 140, 156, 213, 220, 259, 303

GERMANIUM

Germanium–30, 202, 332, 358

GLASS

Glass (general)–30, 31, 37, 59, 61, 81, 90, 96, 103, 104, 127, 129, 139, 154, 157, 158, 164, 165, 184, 186, 187, 214, 215, 217, 223, 224, 227, 244, 249, 260, 261, 263, 267, 271, 274, 275, 317, 332, 335, 340, 356

GOLD AND GOLD ALLOYS

Gold (unalloyed)–123, 188, 203, 271, 281, 305, 317

INTERMETALLICS

Intermetallic Compounds (general)–180

IODIDES/IODATES

Cesium Iodide–106, 212

Lithium Iodate–151, 168

IRON AND IRON ALLOYS

Iron (unalloyed)–69, 93, 116, 122, 128, 183, 202, 313, 354

Iron Alloys (general)–62, 74, 99, 114, 175, 185, 248, 264, 313

Armco Iron–35, 122, 175, 313, 347

LEAD AND LEAD ALLOYS

Lead (unalloyed)–35, 38, 93, 310

Lead Alloys (general)–74

LITHIUM COMPOUNDS

Lithium Niobate–151, 219, 225, 232, 253, 275

MAGNESIUM AND MAGNESIUM ALLOYS

Magnesium (unalloyed)–30, 44, 93

AZ31–299

AZ31B–256

MIRRORS

Mirrors–37, 114, 156, 160, 213, 233, 247, 259, 266, 298, 301, 329, 332

MOLYBDENUM AND MOLYBDENUM ALLOYS

Molybdenum (unalloyed)–53, 64, 68, 87, 93, 116, 153

NICKEL AND NICKEL ALLOYS

Nickel (unalloyed)–53, 93, 114, 116, 153, 200, 202, 305, 306, 317

Nickel Alloys (general)–74

NIOBIUM AND NIOBIUM ALLOYS

Niobium (unalloyed)–114

OPTICAL MATERIALS

Optical Materials (general)–31, 61, 168, 210, 219, 231, 232, 245, 340

OXIDES

Aluminum Oxide–83, 108, 138, 214, 217, 231, 232, 255, 316, 324, 331, 356

Cerium Oxide–138, 140

Cobalt Oxide–313

Copper Oxide–313

Iron Oxide–313

Lead Oxide–114

Magnesium Oxide–138, 255, 324

Nickel Oxide–313

Ruby–37, 83, 129, 154

Sapphire–154, 169, 217, 227, 231, 232, 319, 340, 356

Silicon Oxide–108, 138, 156, 164, 182, 202, 207, 211, 213, 223, 224, 275, 335

Thorium Oxide–275

Titanium Oxide–108, 138, 156, 213, 223, 288

Yttrium Oxide–275

Zirconium Oxide–138, 156, 213, 223

PAINT

Paint–310, 341

PHOSPHATES

Manganese Phosphate–347

Potassium Dihydrogen Phosphate–345

Potassium Phosphate–151, 225, 275

POLYMERS

Polymers (general)–252, 260

Dacron–135

Kapron–135

Lucite–30, 324

Nylon–308

Plexiglas–30, 96, 139, 226, 250, 261, 310

Polyethylene–135, 281

Polyethyleneterephthalate (Mylar)–30, 145

Polymethylmethacrylate–46, 51, 100, 115, 129, 184, 250, 276, 354

Polypropylene–135

Polystyrene–46, 96, 100, 129, 192, 261

Polytetrafluoroethylene (Teflon)–30, 129, 135

PROUSTITE

Proustite (Silver Arsenite)–168, 231, 232

QUARTZ

Quartz–37, 59, 61, 96, 114, 123, 139, 151, 154, 161, 188, 210, 227, 229, 261, 267, 279, 305, 329, 356

REFRACTORY METALS

Refractory Metals (general)–248, 359

SEMICONDUCTOR MATERIALS

Semiconductor Materials (general)–36, 70, 152, 254, 285, 286, 353

SILICATES

Titanium Silicate–247

Zirconium Silicate–247

SILICON

Silicon–70, 152, 153, 291, 311, 327, 332, 353

SILVER AND SILVER ALLOYS

Silver (unalloyed)–38, 39, 42, 123, 129, 271

STEEL-ENGINEERING

Engineering Steel (general)–35, 38, 40, 44, 47, 48, 62, 69, 122, 183, 218, 264, 313, 347

AISI 1045–347

Carbon Steel–38, 47, 48, 62, 209, 264

ShKh-15–313

U-8–122

30KhGSA–195

30Kh10G10–185

40Kh–325

45 Steel–175

STEEL-STAINLESS

Stainless Steel (general)–75, 114, 129, 294, 324

AISI 302–34

AISI 304–200, 255, 256, 299

1Kh18N8–185

30KhGSA–116

STRONTIUM COMPOUNDS

Strontium Titanate–151, 210

SULFIDES

Arsenic Sulfide–220, 274

Cadmium Sulfide–36, 131, 337, 350

Lead Sulfide–30

SULFIDES (Continued)

Zinc Sulfide–36, 37, 108, 114, 138, 140, 156, 204, 205, 213, 220, 223, 259, 350

TANTALUM AND TANTALUM ALLOYS

Tantalum (unalloyed)–53, 64

TIN AND TIN ALLOYS

Tin (unalloyed)–35, 44, 93, 116, 129, 306, 310
Tin Alloys (general)–74, 99

TITANIUM AND TITANIUM ALLOYS

Titanium (unalloyed)–34, 281, 306, 313, 317, 352
Ti-6Al-4V–256, 321, 331, 348
Ti-8Mn–321
Ti-12Mo-6Zr-5N–321
VT14–111
VT15–111

TUNGSTEN AND TUNGSTEN ALLOYS

Tungsten (unalloyed)–32, 39, 64, 93, 153, 305, 307
Tungsten Alloys (general)–74

WATER

Water Coatings–263, 310, 341

YTTRIUM COMPOUNDS

Yttrium Orthovanadate–245, 288

ZINC AND ZINC ALLOYS

Zinc (unalloyed)–39, 93, 115, 116, 153, 306, 341
Zinc Alloys (general)–74

ZIRCONIUM AND ZIRCONIUM ALLOYS

Zirconium (unalloyed)–142

MICROSTRUCTURAL CHANGES

ALKALI HALIDES

Alkali Halides (general)–166, 228, 296, 351

ALUMINIDES

Nickel Aluminide–180

ALUMINUM AND ALUMINUM ALLOYS

Aluminum (unalloyed)–64, 69, 116, 177, 280, 304, 320, 351, 354

Aluminum Alloys (general)–56, 122, 222, 346

6061–251

7075–65, 113, 163, 280, 357

ANTIMONIDES

Gallium Antimonide–155

Indium Antimonide–155

ARSENIDES

Gallium Arsenide–155, 236, 296

BISMUTH

Bismuth–117, 354

BORON

Boron–72

BROMIDES

Potassium Bromide–228

Rubidium Bromide–228

Sodium Bromide–228

CARBIDES

Carbides (general)–328

Iron Carbide–143

Tungsten Carbide–328, 354

CARBON/GRAPHITE

Carbon–199

Diamond–293

Graphite–109, 293, 343, 354

CHROMIUM AND CHROMIUM ALLOYS

Chromium (unalloyed)–119

CHALCOGENIDES

Cadmium Telluride–296, 320

Zinc Selenide–296, 297, 320, 351

CHLORIDES

Potassium Chloride–228, 296, 320, 351

Rubidium Chloride–228

Sodium Chloride–228, 296

COBALT AND COBALT ALLOYS

Haynes 188–137

COMPOSITES

Carbon/Resin Composite–147

Fiber Reinforced Composite–147, 346

Resin Matrix Composite–147

COPPER AND COPPER ALLOYS

Copper (unalloyed)–41, 53, 56, 64, 69, 116

Copper Alloys (general)–222, 354

DIELECTRIC MATERIALS

Dielectric Materials (general)–148, 237, 296

FLUORIDES

Fluorides (general)–149

Calcium Fluoride–346

Lithium Fluoride–346

Magnesium Difluoride–149

Potassium Fluoride–228

Sodium Fluoride–228

Strontium Fluoride–284

Thorium Tetrafluoride–149

GERMANIUM

Germanium–141

GLASS

Glass (general)–103, 104, 148, 174, 184, 340

INTERMETALLICS

Intermetallic Compounds (general)–180

IODIDES/IODATES

Potassium Iodide–228

Rubidium Iodide–228

Sodium Iodide–228

IRON AND IRON ALLOYS

Iron (unalloyed)–56, 69, 116, 122, 171, 183, 262, 273, 282, 313, 354

Iron Alloys (general)–98, 175, 185, 189, 199, 262, 264, 313, 339

IRON AND IRON ALLOYS(Continued)

Armco Iron—122, 175, 201, 347

Fe-3Si—273, 339

Permalloy—257

LEAD AND LEAD ALLOYS

Lead (unalloyed)—56

MOLYBDENUM AND MOLYBDENUM ALLOYS

Molybdenum (unalloyed)—56, 64, 68, 116, 313

Molybdenum Alloys (general)—272

NICKEL AND NICKEL ALLOYS

Nickel (unalloyed)—72, 116, 117

Nickel Alloys (general)—222

Hastelloy X—137

Rene 41—137

TD-Nickel-Cr—137

NIOBIUM AND NIOBIUM ALLOYS

Niobium (unalloyed)—56, 118, 338

OXIDES

Aluminum Oxide—146, 346

Ruby—146

Sapphire—340

Silicon Oxide—149

Titanium Oxide—85

PHOSPHATES

Manganese Phosphate—347

PHOSPHORUS

Phosphorus—72, 117

POLYMERS

Dacron—135

Kapron—135

Polycarbonate—101

Polyethylene—135, 147, 312

Polymethylmethacrylate—101, 147, 184, 354

Polypropylene—49, 135

Polystyrene—101

Polytetrafluoroethylene (Teflon)—135

QUARTZ

Quartz–148, 161, 346

REFRACTORY METALS

Refractory Metals (general)–359

SEMICONDUCTOR MATERIALS

Semiconductor Materials (general)–72, 141, 237

SILICON

Silicon–72, 117, 222, 327

STEEL-ENGINEERING

Engineering Steel (general)–56, 57, 67, 69, 122, 171, 183, 262, 264, 295, 347

AISI 1010–173

AISI 1045–347

AISI 4340–137

Carbon Steel–47, 48, 67, 119, 126, 172, 198, 201, 209, 221, 264, 283

KhVG–189

Kh12M–189, 241

ShKh15–107, 189, 241

ST-3–241

ST-45–*175, 189, 241*

ST-70–235

U-8–122, 189, 241

U-9–172

18KhNVA–191

30Kh10G10–185

35KhG–241

37KhN3A–191

37KhN3M–191

40KhG–241

40Kh13–191

STEEL-MARAGING

Maraging (250)–113

STEEL-STAINLESS

Stainless Steel (general)–75

AISI 410–137

EI627–241

EI943–241

1Kh18N8–185

1Kh18N9T–60, 241

30KhGSA–116

SULFIDES

Zinc Sulfide—149

TANTALUM AND TANTALUM ALLOYS

Tantalum (unalloyed)—64

TIN AND TIN ALLOYS

Tin (unalloyed)—116

TITANIUM AND TITANIUM ALLOYS

Titanium (unalloyed)—56, 85

Titanium Alloys (general)—338

Ti-6Al-4V—113, 137

Ti-6Al-6V-2Sn—137

Ti-10V—89

TUNGSTEN AND TUNGSTEN ALLOYS

Tungsten (unalloyed)—56, 64, 98

ZINC AND ZINC ALLOYS

Zinc (unalloyed)—56, 116, 342

MECHANICAL PROPERTIES

ALKALI HALIDES

Alkali Halides (general)–186, 187, 242, 269, 285, 286

ALUMINIDES

Nickel Aluminide–180

ALUMINUM AND ALUMINUM ALLOYS

Aluminum (unalloyed)–2, 69, 162, 314, 348

Aluminum Alloys (general)–159, 167, 346

A356–19

356–11

Casting Alloys–19, 346

C355–19

D1–84

D16–84

Tens 50–19

1100–162

2014–4, 6, 7, 20, 102, 133

2024–3, 4, 6, 7, 8, 9, 16, 20, 77, 80, 82, 102, 162, 240, 292, 299

5052–71, 162

6061–10, 45, 77, 95, 102, 132, 134, 162, 179, 194, 208, 243, 289

7075–2, 3, 4, 7, 8, 9, 10, 20, 45, 65, 91, 112, 113, 162, 163

7078–6

ARSENIDES

Gallium Arsenide–242

BERYLLIUM AND BERYLLIUM ALLOYS

Beryllium (unalloyed)–27, 230

I-400–45, 162

S-200E–162

BORIDES

Borides (general)–190

BROMIDES

Potassium Bromide–269

CARBIDES

Carbides (general)–190, 328

Silicon Carbide–80

Tungsten Carbide–328

CARBON/GRAPHITE

Carbon–96

Graphite–12, 15, 27, 45, 78

CERAMIC MATERIALS

Ceramic Materials (general)–190, 302

CHALCOGENIDES

Cadmium Telluride–186, 187

Zinc Selenide–186, 187, 268, 286

CHLORIDES

Potassium Chloride–186, 187, 269, 286, 336

COBALT AND COBALT ALLOYS

Haynes 188–196, 197

HS21–1, 2

L-605–3, 11, 20, 21

COMPOSITES

Carbon/Resin Composites–79, 315

Fiber Reinforced Composites–194, 346

Graphite/Al Composite–346

Graphite/Epoxy Composite–315

Graphite/Resin Composites–79

Metal Matrix Composites–238, 346

Resin Matrix Composites–79, 134

Tungsten Composites–238

COPPER AND COPPER ALLOYS

Copper (unalloyed)–12, 15, 27, 41, 69, 132, 162, 317

Cu 5Sn (Bronze)–162

Cu-20Zn (Brass)–162

FLUORIDES

Barium Fluoride–268

Magnesium Fluoride–207

Thorium Fluoride–268

GLASS

Glass (general)–61, 73, 88, 96, 186, 187, 317

GOLD AND GOLD ALLOYS

Gold (unalloyed)–317

INTERMETALLICS

Intermetallic Compounds (general)–180

IRON AND IRON ALLOYS

Iron (unalloyed)–12, 15, 69, 162, 171
Armco Iron –2
Fe-3Cr-1Mo–6
N-155–16, 18, 21

MAGNESIUM AND MAGNESIUM ALLOYS

Magnesium (unalloyed)–162
Magnesium Alloys(general)–3, 167
Casting Alloys–19
AZ31–7, 20, 299
AZ91C–19
HK31A–17, 19, 23
HM21–14, 17, 22
HM31XA–17
Mg-1Mn–2
Mg-3Al-1Zn–2
ZK51A–19
ZH62–11,20
ZH62A–19

MOLYBDENUM AND MOLYBDENUM ALLOYS

Molybdenum (unalloyed)–12, 15, 27, 87, 162
Molybdenum Alloys (general)–18

NICKEL AND NICKEL ALLOYS

Nickel (unalloyed)–162, 317
Hastelloy B–2, 21
Hastelloy C–1, 2, 21
Hastelloy R–21
Hastelloy X–196, 197
Inconel 600–1, 2, 9
Inconel 702–21
Inconel X-750–2, 11, 20, 24, 25, 28
KhN77TYu–58
Nickel 200–15, 27
Nimonic 90–25
Rene 41–21, 24, 25, 196, 197
TD-Nickel-Cr–196, 197
Waspalloy–18
Udimet 500–24

NIOBIUM AND NIOBIUM ALLOYS

Niobium (unalloyed)–118, 162

NITRIDES

Nitrides (general)–190

Silicon Nitride–300, 302

OPTICAL MATERIALS

Optical Materials (general)–61

OXIDES

Oxides (general)–190

Aluminum Oxide–73

Silicon Dioxide–207

Silicon Oxide–45, 54, 207

POLYMERS

Polymers (general)–50

Carbon Phenolic–45, 54

Micarta–45

Plexiglas–45, 96

Polymethylmethacrylate–45, 46, 76

Polystyrene–46, 76, 96

Quartz Phenolic–45

Silica Phenolic–45

QUARTZ

Quartz–54, 61, 88, 96, 194

REFRACTORY METALS

Refractory Metals (general)–190

SEMICONDUCTOR MATERIALS

Semiconductor Materials (general)–285, 286

SILICON

Silicon–73

STEEL-ENGINEERING

Engineering Steel (general)–18, 40, 47, 48, 55, 69, 159, 162, 171

AISI 1010–3

AISI 1020–4, 5, 11, 20

AISI 1042–5

AISI 1080–5

AISI 4130–1, 2, 4, 5, 10, 11, 20, 21

AISI 4340–6, 196, 197

AISI 8630–6

Carbon Steel–47, 48

H-11–22

VKS-1–63

STEEL-MARAGING

Maraging (250)–112, 113, 239

Maraging (300)–112, 206, 239

STEEL-STAINLESS

Stainless Steel (general)–167, 314

A-286–10, 18, 21

AISI 301–11, 18, 20, 25, 28, 80, 292

AISI 304–21, 25, 33, 299

AISI 310–22

AISI 316–15, 162

AISI 321–6, 7, 20, 24

AISI 347–1, 2

AISI 410–10, 13, 24, 196, 197

AISI 446–21

AM350–20, 24

PH15-7Mo–24, 25

17-7PH–6, 10, 11, 16, 20, 27, 28

18/8 Stainless–1, 2, 162

19-9DL–1

25Cr-20Ni-2Si–1, 2

SULFIDES

Arsenic Sulfide–268

Zinc Sulfide–268

TANTALUM AND TANTALUM ALLOYS

Tantalum (unalloyed)–12, 15

Ta-10W–29

TITANIUM AND TITANIUM ALLOYS

Titanium (unalloyed)–7, 132, 133, 314, 317

Titanium Alloys (general)–26

Ti-1Al-8V-5Fe–18

Ti-2Cr-2Mo-2Fe–11, 20

Ti-5Al-2Sn–11, 20, 92

Ti-5Al-5Sn-5Zr–92

Ti-6Al-2Sn-4Zr-2Mo–92

Ti-6Al-4V–9, 14, 16, 18, 20, 45, 80, 92, 112, 113, 120, 136, 162, 196, 197, 292, 348

Ti-6Al-6V-2Sn–196, 197

Ti-8Al-2Cb-1Mo–18

Ti-8Mn–6, 7, 10, 20

Ti-10V–89

Ti-13V-11Cr-3Al–18, 24, 136

THERMAL PROPERTIES

ALKALI HALIDES

Alkali Halides (general)—105, 186, 187, 242, 285, 286

ALUMINUM AND ALUMINUM ALLOYS

Aluminum (unalloyed)—2, 66, 93, 324, 348

Aluminum Alloys (general)—122

2024—8, 80, 82, 256

6061—10

7075—2, 8, 10

ANTIMONIDES

Indium Antimonide—349

ARSENIDES

Gallium Arsenide—242

BORIDES

Borides (general)—190

BROMIDES

Potassium Bromide—105

CARBIDES

Carbides (general)—190

Silicon Carbide—80

CARBON/GRAPHITE

Carbon—93

Graphite—144, 324

CERAMIC MATERIALS

Ceramic Materials (general)—190, 324

CHALCOGENIDES

Chalcogenides (general)—186, 187, 274, 326

Cadmium Telluride—186, 187, 331

Zinc Selenide—186, 187, 274, 286, 309

CHLORIDES

Potassium Chloride—105, 186, 187, 274, 286, 309

Sodium Chloride—105, 309, 331

COBALT AND COBALT ALLOYS

HS21—1, 2

COMPOSITES

Metal Matrix Composite–238

Tungsten Composite–238

COPPER AND COPPER ALLOYS

Copper (unalloyed)–42, 66, 93

DIELECTRIC MATERIALS

Dielectric Materials (general)–86, 94, 124, 154

FLUORIDES

Barium Fluoride–309

Calcium Fluoride–309

Strontium Fluoride–309

GLASS

Glass (general)–86, 94, 154, 274, 326

IRON AND IRON ALLOYS

Iron (unalloyed)–93, 122, 330

Iron Alloys (general)–330

Armco Iron–2, 122, 330

LEAD AND LEAD ALLOYS

Lead (unalloyed)–93

MAGNESIUM AND MAGNESIUM ALLOYS

Magnesium (unalloyed)–93

AZ31B–256

HM21XA–14

MG-1Mn–2

Mg-3Al-1Zn–2

MOLYBDENUM AND MOLYBDENUM ALLOYS

Molybdenum (unalloyed)–93

NICKEL AND NICKEL ALLOYS

Nickel (unalloyed)–93

Hastelloy B–2

Hastelloy C–1, 2

Inconel 600–1, 2

Inconel X-750–2, 24

Rene 41–24

Udimet 500–24

NIOBIUM AND NIOBIUM ALLOYS

Niobium (unalloyed)–97, 335

NITRIDES

Nitrides (general)—190

Silicon Nitride—300, 302

OXIDES

Oxides (general)—190

Aluminum Oxide—316, 324, 331

Magnesium Oxide—324

Ruby—154

Sapphire—94, 154

POLYMERS

Phenolics (general)—144

QUARTZ

Quartz—86, 154

REFRACTORY METALS

Refractory Metals (general)—190

SEMICONDUCTOR MATERIALS

Semiconductor Materials (general)—285, 286

SILVER AND SILVER ALLOYS

Silver (unalloyed)—42

STEEL-ENGINEERING

Engineering Steel (general)—122

Carbon Steel—66

AISI 4130—1, 2, 10

KhVG—330

Kh12M—241

Sh15—241

ST-3—241

ST-45—241, 330

U-8—122, 241, 330

35KhG—241

40KhG—241

STEEL-STAINLESS

Stainless Steel (general)—97, 324

A-286—10

AISI 301—80

AISI 304—33, 256

AISI 321—24

AISI 347—1, 2

AISI 410—10, 24

STEEL-STAINLESS (Continued)

AM350–24
EI627–241
EI943–241
PH15-7Mo–24
1Kh19N9T–241
17-7PH–10
18/8 Stainless–1, 2
19-9DL–1
25Cr-20Ni-2Si–1, 2

SULFIDES

Arsenic Sulfide–274

TANTALUM AND TANTALUM ALLOYS

Ta-10W–29

TIN AND TIN ALLOYS

Tin (unalloyed)–93

TITANIUM AND TITANIUM ALLOYS

Ti-6Al-4V–14, 80, 256, 331, 348
Ti-8Mn–10
Ti-13V-11Cr-3Al–24

TUNGSTEN AND TUNGSTEN ALLOYS

Tungsten (unalloyed)–93

VANADIUM AND VANADIUM ALLOYS

Vanadium (unalloyed)–97

ZINC AND ZINC ALLOYS

Zinc (unalloyed)–93

ELECTRICAL PROPERTIES

ALKALI HALIDES

Alkali Halides (general)—356

ALUMINUM AND ALUMINUM ALLOYS

Aluminum Alloys (general)—200

BERYLLIUM AND BERYLLIUM ALLOYS

Beryllium (unalloyed)—150

CHLORIDES

Potassium Chloride—356

COPPER AND COPPER ALLOYS

Copper (unalloyed)—291

FLUORIDES

Calcium Fluoride—356

Lithium Fluoride—356

GERMANIUM

Germanium—125, 246

GLASS

Glass (general)—356

IRON AND IRON ALLOYS

Iron (unalloyed)—262

Iron Alloys (general)—262

NICKEL AND NICKEL ALLOYS

Nickel (unalloyed)—200

NIOBIUM AND NIOBIUM ALLOYS

Niobium (unalloyed)—338

OXIDES

Aluminum Oxide—356

Sapphire—356

QUARTZ

Quartz—125, 356

SILICON

Silicon—291

STEEL-ENGINEERING

Engineering Steel (general)—262

STEEL-STAINLESS

AISI 304—200

TITANIUM AND TITANIUM ALLOYS

Titanium Alloys (general)—338