

**DOD HIGH TEMPERATURE MATERIALS INFORMATION ANALYSIS CENTER
(HTMIAC)**

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March 21, 1995



Mr. Jerome Persh
Senior Specialist for Materials and Structures
Office of the Director of Defense Research and Engineering
(Advanced Technology)
ATTN: ODDR&E (AT)
The Pentagon, Room 3D1089
Washington, DC 20301-3080

Subject: HTMIAC Interim Report 25 and Its Corresponding
Computerized PC-Based Numerical Database
Contract No.: DLA900-93-D-5002

Dear Mr. Persh:

We are submitting the enclosed two copies of the following HTMIAC
interim report:

HTMIAC Report 25 (Interim): "Optical, Thermoradiative,
Thermophysical, and Mechanical Properties of Silicon,"
Part 1, 338 pages, Part 2, 490 pages

and its corresponding computerized personal computer (PC)-based
numerical database on a diskette entitled "HTMIAC/CINDAS Silicon
Properties Database" with its accompanying user's guide.

The draft report and the corresponding PC-based database, the distribution
statement for the report and database, and the distribution list which
contains the names of 107 individuals in the DoD, Army, Navy, Air Force,
ARPA, ... agencies and laboratories have been reviewed and approved by
Mr. Roger E. Rondeau.

The computerized database is managed and operated by using CINDAS' own
proprietary database management software (DBMS) and data plotting
software (DPS). Therefore, no other DBMS or DPS, commercial or
otherwise, is required for using this database.

Approved for public release
Distribution Unlimited

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Sincerely,



C. Y. Ho
Director, HTMIAC

Enclosure: Two copies of HTMIAC Report 25 (Interim) and the corresponding computerized PC-based interim numerical database on diskette with accompanying user's guide

cc with one copy of report and database on diskette:

Defense Technical Information Center
ATTN: DTIC-AI/Mr. Ronald E. Hale
Cameron Station, Building 5
Alexandria, VA 22304-6145

cc with two copies of report and database on diskette:

Air Force Wright Laboratory
ATTN: WL/MLPJ/Mr. Roger E. Rondeau
Bldg. 651, Ste 1
3005 P Street
Wright-Patterson AFB, OH 45433-7702

Defense Technical Information Center ✓
ATTN: DTIC-OCC
Cameron Station, Building 5
Alexandria, VA 22304-6145

cc without enclosure:

Defense Electronics Supply Center
ATTN: DESC-EACC/Ms. Cheryl A. Montoney
1507 Wilmington Pike
Dayton, OH 45444-5181

ONRRR-Chicago/Mr. John J. Mumma
Federal Building, Room 286
536 South Clark Street
Chicago, IL 60605-1588

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**HTMIAC/CINDAS
SILICON PROPERTIES DATABASE
(INTERIM)**

USER'S GUIDE

March 1995

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Developed under the Sponsorship of the
Defense Technical Information Center (DTIC)

by

HIGH TEMPERATURE MATERIALS INFORMATION ANALYSIS CENTER (HTMIAC)

CINDAS/Purdue University

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**HTMIAC/CINDAS
SILICON PROPERTIES DATABASE
(INTERIM)**

USER'S GUIDE

NOTICE

"The Silicon Properties Database is developed by HTMIAC/CINDAS/Purdue University under the sponsorship of the Defense Technical Information Center (DTIC). Neither DTIC, HTMIAC, the Center for Information and Numerical Data Analysis and Synthesis (CINDAS), Purdue University nor any person acting on behalf of any of them (1) makes any warranty or representation whatsoever, expressed or implied, with respect to any data/information provided in this database or (2) assumes responsibility for any damages or other liability whatsoever (including any consequential damages even if DTIC, HTMIAC, or CINDAS or any DTIC, HTMIAC, or CINDAS representative has been advised of the possibility of such damages) resulting from the use of this database or any data/information contained in the database. This database is managed and operated by using CINDAS' own proprietary database management software (DBMS) and data plotting software (DPS). Therefore, no other DBMS or DPS, commercial or otherwise, is required for using this database."

I. INTRODUCTION

The High Temperature Materials Information Analysis Center (HTMIAC), a U.S. Department of Defense (DoD) Information Analysis Center, is sponsored and administratively managed and funded by the Defense Technical Information Center (DTIC), ATTN: DTIC-AI, Cameron Station, Alexandria, VA 22304-6145, and is under the DoD IAC program management of Mr. Ronald E. Hale. HTMIAC is operated by the Center for Information and Numerical Data Analysis and Synthesis (CINDAS), Purdue University, West Lafayette, Indiana 47906-1398 under Contract DLA900-93-D-5002. The contract was awarded to Purdue by the Defense Electronics Supply Center (DESC), ATTN: DESC-EACC, Dayton, Ohio 45444-5181 with Ms. Cheryl A. Montoney as the Contracting Officer. HTMIAC is under the technical direction of Mr. Jerome Persh, Senior Specialist for Materials and Structures, Office of the Director of Defense Research and Engineering (Advanced Technology), ATTN: ODDR&E (AT), The Pentagon, Room 3D1089, Washington, DC 20301-3080 and Mr. Roger E. Rondeau, Air Force Wright Laboratory, ATTN: WL/MLPJ, Wright-Patterson Air Force Base, Ohio 45433-7702.

The Silicon Properties Database presents numerical data and technical information on the properties of pure and doped silicon. Materials comprise a variety of doped silicon materials, having both n-type and p-type conduction, as well as intrinsic silicon. Property coverage includes optical (absorption coefficient, refractive index, and band gap), thermoradiative (normal spectral reflectance, angular spectral reflectance, normal spectral emittance, and normal spectral transmittance), electrical (electrical conductivity and dielectric constant), thermophysical (thermal conductivity, specific heat, thermal expansion, and lattice parameters), damage threshold (rain erosion and laser irradiation), and mechanical (elastic constants, stress-strain, yield strength under tensile, compressive, and shear loading, flexural strength, fracture toughness, and hardness).

Property data for silicon that are available in the literature are widely recognized to be sensitive to variations in material related factors. Many issues that are important in determining property behavior of these materials have been sought out in our database activity. Our objective is to bring them together into a single volume (database), and to document the data and supporting information that bear upon the behavior of silicon, in particular the temperature, wavelength, and composition (purity, dopants, carrier concentration) dependence of its properties.

The present compilation of analyzed property data on silicon is part of a continuing effort for the development, expansion, update, and upgrade of the High Temperature Materials Properties (HTMP) Database, a computerized, online, numerical/technical database containing numerical data and technical information on materials and properties of interest to high temperature materials technologies. The property data compiled are extensively searched from the open literature and government reports, subjected to selection criteria established for material property data capture activities at HTMIAC/CINDAS, and evaluated and analyzed on a property basis in order to clarify discordant data issues and to make effects of influential variables upon property behavior more readily evident to users of the data.

II. SEARCHING THE DATABASE

A data search can be started by selection of either material or property. In each case, either a sub-group menu selection or a name-string search option will lead the user into the first level of the search. The on-screen menus then narrow the search to a specific material or property. The second level of searching, accomplished through a sequence of on-screen menus, leads the user to a specific combination of material and property. The user can review the search results by opting to view the dataset information, the data only, the reference, or to generate a data plot. A flow chart illustrating the paths taken during search queries is given on page 5 of this User's Guide.

An important feature included in this interim version of the Silicon Properties Database is *graphical display of property data for more than one material*. The data table portions of datasets retrieved during the session are saved in the form of data files for purposes of graphical display. All data files associated with one property and several materials can be graphically displayed together, allowing a direct comparison of the property data.

III. HARDWARE AND SOFTWARE REQUIREMENTS

- (1) Personal Computer, IBM compatible.
- (2) Monitor with EGA or VGA.
- (3) Minimum 512 kilobytes of memory.

- (4) MS-DOS 3.0 or higher.
- (5) A 3 1/2" 1.44 Mb disk drive.
- (6) A hard disk with 2 Mb available space.

IV. DATABASE INSTALLATION

- (1) Make the root directory of your hard drive current.
- (2) If the diskette drive "b" is used as source drive, enter the command:

assign a=b <CR>

- (3) Insert the diskette provided into the source drive.
- (4) Enter the command:

a:install <CR>

By default, INSTALL will create a directory C:\SIL, if one is not present, into which the database files will be copied.

(Note: If the program does not install properly, make a directory called SIL and then try to install again (Step 4).)

If another directory name is preferred, INSTALL will use the path given by you as command parameter. For example, with the command

a:install d:\OTHER <CR>

INSTALL will create the subdirectory "OTHER" under the root directory of drive "d," where the database files will be copied.

If a working directory other than the root directory is preferred, then simply create a subdirectory, move to that directory and then use one of the above installation commands.

- (5) Wait for the return prompt.

V. USING THE DATABASE

Within the directory which hosts the HTMIAC/CINDAS Database, simply enter the command:

htmiac <CR>

to start the menu-driven system for the database search. After that, all that needs to be done is follow the prompted menus and instructions for search, retrieval, and display of data/information.

The flowchart diagram on the following page illustrates the sequence of search options that the user may follow to obtain desired material property data and information.

If any questions do arise, please contact Mr. David L. Taylor/HTMIAC at:

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