

Alloy Phase Diagram Resources from ASM International

ASM has established a strong brand identity and reputation in the field of phase diagrams. Starting in 1978, ASM established a cooperative agreement with the National Institute of Standards and Technology (then National Bureau of Standards) to raise \$4 million and to publish and continue to update phase diagrams so that engineers and scientists would have the best thermodynamic tools on which to base new discoveries, explain failures, etc. The program that resulted has spanned more than 20 years and involved hundreds of scientific workers, comprehensive scans of the literature, and substantial publications. The binary and ternary books and CDs that have been developed are well-known internationally and are commonly cited as authoritative.

In 1987, the Alloy Phase Diagram International Commission (APDIC) was formed in partnership with other programs operating in Europe and Asia. This group continues to thrive after 20 years and meets once per year to share information regarding projects and alloy systems that are under study. This meeting forms the basis for international collaborations.

ASM Alloy Phase Diagrams Center

The **ASM Alloy Phase Diagrams Center** allows subscribers to explore, search and view more than 10,000 binary and 20,000 ternary phase diagrams and associated phase data for more than 2400 systems from their Web browsers.

Technical Journal

Journal of Phase Equilibria and Diffusion

The *Journal of Phase Equilibria and Diffusion* features critical phase diagram evaluations on scientifically and industrially important alloy systems, authored by international experts. This journal is critically reviewed and contains basic and applied research results, a survey of current literature, and other pertinent articles. The journal also covers the significance of diagrams as well as new research techniques, equipment, data evaluation, nomenclature, presentation, and other aspects of phase diagram preparation and use. It also includes information on phenomena such as kinetic control of equilibrium, coherency effects, impurity effects, and thermodynamic and crystallographic characteristics.

Phase Diagram and Crystallographic Resources **Reference Books – Phase Diagrams**

Binary Alloy Phase Diagrams, Second Edition

Introduced in 1990, the revised 'Massalski' set has become the world standard, completely replacing Hansen's original compilation by updating the data and expanding coverage to include all 2,965 known binary-alloy systems. For the convenience of engineers and scientists, both weight and atomic percent composition scales are presented in over 4,700 phase diagrams. To insure accuracy and consistency, the diagrams were prepared by computer technology and then double-checked by experts. Digitized from original Program graphs or redrawn from carefully selected data sources, each diagram is in accordance with established thermodynamic principles and consistent with melting and phase-transition temperatures of the pure elements.

Handbook of Ternary Alloy Phase Diagrams

The largest collection of ternary phase diagrams and related crystal structure data ever assembled can be found in this 10-volume set published in 1995. The Handbook includes 18,000 published diagrams (liquidus projections, isotherms, isopleths, and pseudobinaries), exhaustive bibliographies by Dr. Alan Prince, and diagrams from the compilations from the International Programme for Alloy Phase Diagrams. The volumes cover 7,380 ternary systems and include ternary phase diagrams for 3,317 alloy systems, as well as crystallographic data on 7,050 systems and more than 43,000 citations of included literature. All diagrams were redrawn to uniform standards for easy use and comparison with temperatures given in degrees C and all compositions given in atomic percent.

Desk Handbook: Phase Diagrams for Binary Alloys

Published in 2000, the Desk Handbook is a single-volume handbook containing just binary phase diagrams and crystal structure data. Peer reviewed by the Japanese Committee for Alloy Phase Diagrams, this volume updates the previous print compilation of binary phase diagrams by 10 years. It includes 2,332 diagrams of which 605 are new or greatly revised diagrams since the publication of *Binary Alloy Phase Diagrams, Second Edition*, and 171 are not included in that set. Also contained are approximately 600 crystal structure tables of systems for which phase diagrams are unknown. Diagrams are presented in consistent size with the principal axis in atomic percent, with a secondary axis in weight percent. References are given to the original literature source.

Phase Diagrams of Dilute Binary Alloys

For those who work closely with phase diagrams, this handbook is a necessary supplement to the *Desk Handbook: Phase Diagrams for Binary Alloys*. In most cases, the range of a dilute solution covered in this handbook is simply the range in which the diagram is difficult or impossible to read from the full-scale version in the Desk Handbook. A phase diagram with a full-scale range up to approximately 10 at.% is difficult to read when it is shown compressed in a 0-100 at.% complete diagram. Therefore, all diagrams assembled in this handbook were adopted from partial diagrams with composition ranges less than 10 at.%. These were selected from published diagrams, which were determined experimentally or by calculation with special interest in this limited solution range.

Reference Books – Crystallographic Data

Pearson's Handbook of Crystallographic Data for Intermetallic Phases, 2nd Edition

The most comprehensive work on crystal structure to date, Pearson's Second Edition provides critical evaluation with unequalled reliability in a form that is convenient and easy to use. In addition to remarks on the concentration temperature and pressure dependence of the unit cell dimensions and pressure-temperature diagrams, all of the references are included in full citation. The four-volume Pearson's Handbook, Second Edition, covers 75 years of world literature through 1989, and includes additional information, whenever available, such as calculated densities, colors, in-depth detailed diffraction data, standard deviations of unit cell dimensions, point-set symmetries, and full references including publication titles. The volumes include

two extended structure type indexes, each type followed by a table of all compounds that crystallize within that type, three short structure type indexes, a mineral name index, and a Strukturbericht Symbol index.

Atlas of Crystal Structure Types for Intermetallic Phases

The four-volume *Atlas of Crystal Structure Types for Intermetallic Phases* gives pictorial detail, clearly illustrated. The Atlas is the perfect reference to keep beside the Second Edition of Pearson's Handbook. For each structure type, the user can quickly find for all atoms (point sets):

- A list of all coordination atoms with corresponding coordinates, the distance to its central atom, its coordination number and its polyhedron code.
- A histogram of the number of surrounding atoms (n) versus interatomic distances between the central atom and surrounding atoms, the interatomic distances are given relative to the shortest distance and nearest in the coordination polyhedron (d_n/d_{nearest}).
- The standard setting of all structure types is analogous to Pearson's Second Edition data.
- All point sets are numbered consistently throughout a structure type, so each atom can easily be traced in all drawings and tables.

Pearson's Handbook Desk Edition

Comprising all the international literature from 1913 to 1995 and including detailed crystallographic data for unary, binary, and ternary phases, excluding halides and ternary (or quaternary) oxides, the two-volume Pearson's Handbook Desk Edition covers more than 27,600 compounds, with all data critically evaluated. Structure type is given for all entries and 54% of entries include the coordinates of the atoms. This handy desk reference includes a full 67-page structure-type index (with all its representatives).

CDs

Pearson's Crystal Data – Crystal Database for Inorganic Compounds

Published in 2007, Pearson's Crystal Data CD-ROM contains crystal structures of a large variety of inorganic materials and compounds. The first release contains 150,000 structural data sets (including atom coordinates and displacement parameters, when determined) for more than 95,000 different phases, roughly 12,000 experimental powder diffraction patterns, and about 130,000 calculated patterns (interplanar spacings, intensities, Miller indices). Innovative retrieval software developed by Crystal Impact offers a variety of new features for easy retrieval of the desired information. Content is updated on an annual basis with comprehensive world literature coverage and fully standardized and comparable crystal structure data. The database includes more than 30,000 figure descriptions for cell parameters as a function of temperature, pressure, or concentration.

Pauling File Binaries Edition – Inorganic Material

The Pauling File Binaries Edition CD is a comprehensive source of thermodynamic, crystal structure, powder diffraction, and physical property data for binary systems. All inorganic ordered solid state materials are covered. Data included consists of 8,000 binary phase diagrams, both evaluated and as-published; 28,000 data sets of crystallography and structure data, describing 10,000 different phases; 3,000

published and 27,000 computed powder patterns; and 17,300 physical property data sets, including about 43,000 data entries.

Handbook of Ternary Alloy Phase Diagrams CD

The *Handbook of Ternary Alloy Phase Diagrams CD* includes all the phase diagrams from the 10-volume book set. A powerful search engine enables maximum utility. Features include powerful database searching of intermetallic compounds and ternary phases by key descriptors, included compound formula, structure type, melting point, density, Pearson symbol, space group symbol or number, unit cell dimension or angle, author, and more.

Monographs

Each volume in the Phase Diagram monograph series presents the most complete, authoritative, and reliable phase equilibria information ever published on the alloys. Each volume comprises critical evaluations of the individual alloy systems performed by experts under the ASM/NIST Data Program for Alloy Phase Diagrams. The Monograph Series includes *Phase Diagrams of Binary Iron Alloys*, *Phase Diagrams of Binary Titanium Alloys*, *Phase Diagrams of Ternary Nickel Alloys*, *Phase Diagrams of Quaternary Iron Alloys*, and more.