

Quantitative Size Factors for Solid Solutions based on Silver, Cadmium and Zinc

During an investigation into certain hexagonal close-packed phases in binary alloys based on zinc and cadmium, it was necessary to determine the lattice constants of the primary solid solutions. Using an X-ray diffractometer the Bragg angles were measured by the double scanning technique [1], and the lattice constants calculated employing the computer method suggested by Farrar [2].

The results given in table I for the Ag/Cd and Ag/Zn systems compare well with the data published by King [3]. In the case of zinc and cadmium solutions containing manganese, the large values of the Vegard Law Factor (VLF) suggest that the electronic structure of the manganese is considerably modified when it is dissolved in either of the primary solid solutions [5]. Of particular interest is the Cd/Li system, in which an unusually large terminal solid solution has been revealed [4]. As the lattice constants show no measurable change with composition, this indicates that the lithium ion can fit into the cadmium lattice with little or no size distortion.

TABLE I Volume size factor (Ω_{sf}), linear size factor (lsf), Vegard's law factor (VLF) and limiting concentration (c_{max}) for solid solutions based on silver, cadmium and zinc.

Solution	c_{max} (at. %)	Ω_{sf} (%)	lsf (%)	VLF (%)
Ag/Cd	15	+15.42	+4.8	-8.81
/Zn	35	-13.38	-4.7	-2.95
Cd/Ag	7	-34.75	-13.2	-17.43
/Au	3	-46.41	-18.7	-31.52
/Li	25*	<1.00	<0.1	<1.00
/Mn	1*	+12.93	+5.9	+99.71
Zn/Ag	6	-18.42	-3.8	-27.22
/Li	1*	-6.55	-2.3	-34.10
/Mn	1	+24.21	+8.1	+57.42

*Experimental limit

References

1. H. W. KING and L. F. VASSAMILLET, *Advances in X-ray Analysis*, 5 (1962) 78.
2. R. A. FARRAR, *J. Sci. Instr.* 43 (1966) 392.
3. H. W. KING, *J. Matls. Sci.* 1 (1966) 79.
4. R. A. FARRAR and H. W. KING, to be published.
5. R. A. FARRAR, Ph.D. thesis, University of London (1967).

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Book Review

The New Materials

D. Fishlock

Pp 240 (John Murray, 1967) 45s

This is an excellent and popularly written book about the new materials that stand at the forefront of modern technology. These materials are discussed sometimes at an atomic level and sometimes at a macroscopic level. Their importance to modern technology and their potentialities for further development are vividly described with constant reference back to the end-products in which the materials or devices are used. The author ranges across the whole materials' spectrum, not systematically but

picking out important subjects here and there, and the text is very readable. Some idea of the broadness of its subject coverage is given by the following items chosen randomly, one from each page of the index: alumina and lasers; bio-engineering and silicones; Concorde airliner; fuel cells; glass-ceramics; hydrostatic forming; synthetic leathers; magnetic memories; cermets as nuclear fuels; harnessing plasmas; organic materials as semiconductors; high-field superconductors; thermonuclear fusion; whiskers for strengthening.

Because this is not in any sense a textbook, it is easy to pick out passages that are scientifically inexact and the pedantic reviewer will have a

field-day; the specialist may well be irritated at the superficial coverage of his subject, but if he reads the whole book his vision will be broadened and his interest may be quickened to seek elsewhere more detailed information on subjects outside his own field. The book should prove very attractive to anyone having a professional connexion with materials technology, and reading it will help to take the mystery out of many developments that are frequently referred to in modern technological literature but which may not be widely understood among the general readership. The school-leaver and the undergraduate too should find it attractive because it conveys much of the excitement, promise, and importance of materials research and development that the erudite textbooks cannot.

The text is well illustrated with diagrams and photographs and there is a fairly adequate glossary. The only question left in this reviewer's mind was whether it might not have been better to bring it out as a paperback and so increase its chance of being privately purchased as widely as it deserves.

F. J. P. CLARKE

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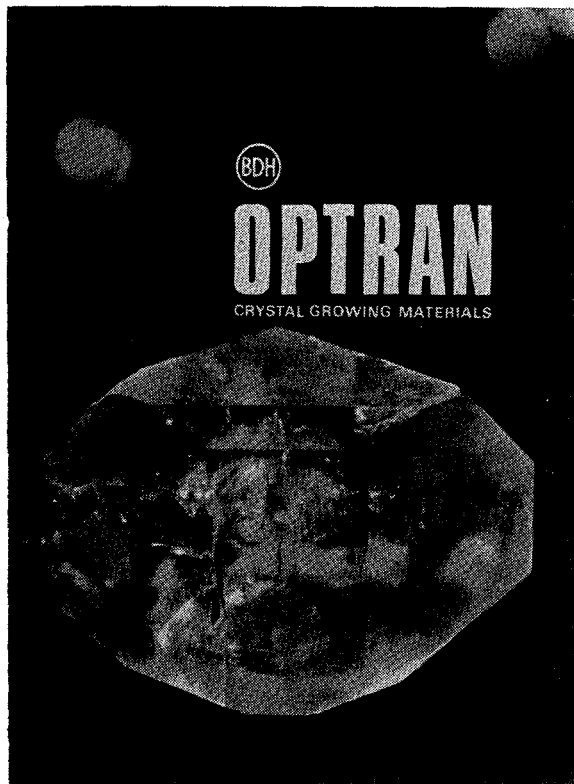
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