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 (Ωsf), 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. %)	Ωsf (%)	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

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Pp 240 (John Murray, 1967) 45*s*

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