

The theory of the transition metals is still a matter of considerable controversy, and vapour pressure measurements have been used to cast light on the atomic bonding processes. Robins, in 1959 (21), postulated that the metals towards the centre of the second and third long periods tended towards higher stability as the number of bonding electrons approached half the effective co-ordination number. The high heats of vaporisation of tungsten and molybdenum were used as an illustration of this conception. Compressibility values, which according to other authorities (22) provide a more reliable indication of bond strength in the crystalline state, reach minimum values at ruthenium and iridium. The heats of evaporation and compressibilities of the elements most concerned in these hypotheses are plotted in Fig. 5.

References

- 1 C. E. Claus, *J. Prakt. Chem.*, 1860, **80**, 282 (Chemical News, 1861, **3**, 194)
- 2 T. A. Edison, *Chem. News*, 1879, **40**, 152-154
- 3 I. Langmuir and G. M. J. Mackay, *Phys. Rev.*, 1914, **4**, 377
- 4 H. A. Jones, I. Langmuir and G. M. J. Mackay, *Phys. Rev.*, 1927, **30**, 201
- 5 R. F. Hampson and R. F. Walker, *J. Res. Nat. Bur. Stand.*, 1961, **65A**, (4) 289
- 6 L. H. Dreger and J. L. Margrave, *J. Phys. Chem.*, 1960, **64**, 1323
- 7 O. Knacke and I. N. Stranski, *Progress in Metal Physics*, 1956, **6**, 181
- 8 A. N. Nesmeyanov, *Vapour Pressure of the Chemical Elements*, 1963, Amsterdam, Elsevier
- 9 J. F. Haefling and A. H. Daane, *Trans. Met. Soc. A.I.M.E.*, 1958, **212**, 115
- 10 R. F. Hampson and R. F. Walker, *J. Res. Nat. Bur. Stand.*, 1962, **66A**, (2), 177
- 11 A. A. Hasapis, M. B. Panish and C. Rosen, *The Vaporisation and Physical Properties of Certain Refractories*, Part I, WADD-TR-60-463, Oct. 1960
- 12 M. B. Panish and L. Reif, *J. Chem. Phys.*, 1961, **34**, (6), 1915
- 13 A. A. Hasapis, A. J. Melveger, M. B. Panish, L. Reif and C. L. Rosen, *The Vaporisation and Physical Properties of Certain Refractories*, Part II, WADD-TR-60-463, Oct. 1962
- 14 R. W. Roberts, *Brit. J. Appl. Phys.*, 1963, **14**, (9), 537
- 15 R. W. Roberts, *Trans. Faraday Soc.*, 1962, **58**, 1159
- 16 L. H. Dreger and J. L. Margrave, *J. Phys. Chem.*, 1961, **65**, (11), 2106-2107
- 17 M. B. Panish and L. Reif, *J. Chem. Phys.*, 1962, **37**, (1), 128
- 18 D. R. Stull and G. C. Sinke, *Thermodynamic Properties of the Elements*, American Chemical Society, Washington, D.C., 1956
- 19 L. Brewer, Paper No. 3, *Chemistry and Metallurgy of Miscellaneous Materials*, edited by L. L. Quill, McGraw-Hill Book Co, New York, 1950
- 20 E. Anderson and W. Hume-Rothery, *J. Less Common Metals*, 1960, **2**, (6), 413-450
- 21 D. A. Robins, *J. Less Common Metals*, 1959, **1**, 396-410
- 22 W. Hume-Rothery and B. R. Coles, *Advances in Physics*, 1954, **3**, (10) 149-243
- 23 P. W. Bridgman, *The Physics of High Pressures*, 1949, G. Bell, London
- 24 R. E. Honig, *R.C.A. Rev.*, 1962, **23**, (4), 567-586

Co-precipitation of Alloy Powders

Co-precipitation or co-reduction of two or more platinum metals from mixed solutions of their salts has been widely practised in the past but there are few records of any study of the structure of the resulting powders.

In a letter to *Nature* (1964, **203**, 857) Eugene L. Holt, of Esso Research & Engineering Co, reports on the examination of some platinum-gold, platinum-iridium and palladium-gold powders made by reducing mixed 0.5M chloride solutions with 1.85M sodium borohydride solution at 50°C. The powders precipitated from platinum-gold solutions had compositions corresponding

closely to those of the solutions from which they were formed and X-ray analyses indicated them to have the structure of a uniform solid solution of the two metals. Solid solution powders containing 40, 60 and 80 per cent of gold were made in this manner.

Powders precipitated from platinum-iridium solutions, however, contained appreciably less iridium than the solutions from which they were precipitated and the powders from solutions containing 80 per cent of iridium, for example, showed two sets of X-ray patterns indicating the presence of a platinum-rich alloy and an iridium-rich alloy.