

References

- 1 G. Hogarth, M. Hadji-Bagheri, N. J. Taylor and A. J. Carty, *J. Chem. Soc., Chem. Commun.*, 1990, 1352 and references cited
- 2 C. Mealli and D. M. Proserpio, *J. Am. Chem. Soc.*, 1990, **112**, 5484
- 3 R. T. Baker, J. C. Calabrese and T. E. Glassman, *Organometallics*, 1988, **7**, 1989; R. T. Baker, W. C. Fultz, T. B. Marder and I. D. Williams, *Organometallics*, 1990, **9**, 2357
- 4 G. Predieri, A. Tiripicchio, M. Tiripicchio Camellini, M. Costa and E. Sappa, *Organometallics*, 1990, **9**, 1729
- 5 M. Castiglioni, R. Giordano and E. Sappa, *J. Organomet. Chem.*, 1989, **362**, 399; *ibid.*, 1989, **369**, 419
- 6 (a) D. Braga, A. J. M. Caffyn, M. C. Jennings, M. J. Mays, L. Manojlovic-Muir, P. R. Raithby, P. Sabatino and K. W. Woulfe, *J. Chem. Soc., Chem. Commun.*, 1989, 1401; (b) G. Conole, M. McPartlin, M. J. Mays and M. J. Morris, *J. Chem. Soc., Dalton Trans.*, 1990, 2359
- 7 H. Vahrenkamp, *Pure Appl. Chem.*, 1989, **61**, 1777; *J. Organomet. Chem.*, 1990, **400**, 107
- 8 D. Mani, H.-T. Schacht, A. K. Powell, H. Vahrenkamp, *Chem. Ber.*, 1989, **122**, 2245
- 9 U. Zenneck, *Angew. Chem., Int. Ed. Engl.*, 1990, **29**, 126
- 10 M. A. Ciriano, S. Sebastian, L. A. Oro, A. Tiripicchio, M. Tiripicchio Camellini and F. J. Lahoz, *Angew. Chem., Int. Ed. Engl.*, 1988, **27**, 402
- 11 M. T. Pinillos, A. Elduque, L. A. Oro, F. J. Lahoz, F. Bonati, A. Tiripicchio and M. Tiripicchio Camellini, *J. Chem. Soc., Dalton Trans.*, 1990, 989
- 12 P. Braunstein and J. Rosé, in "Stereochemistry of Organometallic and Inorganic Compounds", ed. I. Bernal, Amsterdam, Elsevier, 1989, Vol.3, Chapter 1, pp. 3-138
- 13 F. Castagno, M. Castiglioni, E. Sappa, A. Tiripicchio, M. Tiripicchio Camellini, P. Braunstein and J. Rosé, *J. Chem. Soc., Dalton Trans.*, 1989, 1477
- 14 P. Moggi, G. Predieri, G. Albanesi, S. Papadopoulos and E. Sappa, *Appl. Catal.*, 1989, **53**, L1
- 15 P. Braunstein, M. Knorr, A. Tiripicchio and M. Tiripicchio Camellini, *Angew. Chem., Int. Ed. Engl.*, 1989, **28**, 1361; P. Braunstein, M. Knorr, E. Villarroya and J. Fischer, "New Perspectives in Organometallic Chemistry", ed. P. Braunstein and W. A. Herrmann, *New J. Chem.*, 1990, **14**, 583
- 16 P. Braunstein, B. Oswald, A. Tiripicchio and M. Tiripicchio Camellini, *Angew. Chem., Int. Ed. Engl.*, 1990, **29**, 1140

Advances in the Study of Platinum Group Elements

Progress in the understanding of the mineralogy of platinum group metals worldwide is reported in *The Canadian Mineralogist*, 1990, **28**, (3). Of the twenty-one papers included, twelve were presented at the annual meeting of the Geological and Mineralogical Associations of Canada (GAC-MAC) which was held in Montreal, in May 1989. The remainder are new papers, all relevant to the theme of the above title.

The section on occurrences consists of nine papers, commencing with the 1990 MAC Presidential address given by J. M. Duke on the implications of magmatic segregation process models for Kambalda-type nickel sulphide deposits. A unifying model of the magmatic mineralisation process in layered intrusions is proposed by A. J. Naldrett, G. E. Brüggmann and A. H. Wilson. This attempts to account for the various platinum group metal concentrations found in different deposits of apparently similar genesis.

As these magmatic processes become better understood, the apparent exceptions to the rule, such as the Alaskan-type Tulameen deposits in British Columbia, attract greater interest. There, as discussed by G. T. Nixon, L. J. Cabri and J. H. G. Laflamme, platinum-

iron-copper alloys and osmium-iridium-ruthenium minerals appear to have crystallised directly from a silicate magma. This paper serves as a link to the next section, which includes discussions on ophiolite deposits containing platinum group metals. It is suggested that sulphur concentration is the factor controlling mineralisation in a silicate matrix.

Hydrothermal processes for the transport and deposition of platinum group metals are also considered, including a study by J. H. Crockett of platinum group metal mineralisation in sulphide-rich deposits near to sub-sea hydrothermal vents on ocean ridges. For surface deposits, the importance of ground water transport involving fulvic acid and simple organic analogues is discussed by S. A. Wood.

A mineralogical study of the system platinum-antimony-tellurium has been carried out by W.-S. Kim and G. Y. Chao, and a new palladium-copper-tellurium-sulphur mineral species, Vasilite, is reported by A. V. Atanasov.

While some of the deposits considered may never be economically viable, either for platinum group metal or base metal exploitation, the implications of the work reported for the overall understanding of the subject cannot be over-estimated.

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