
BOOK REVIEW

The Chemistry of Precious Metals

By S.A. Cotton, Published by Blackie Academic and Professional, London, 1997, 374 pages, ISBN 0 7514 0413 6, Price £99.00

The first three parts of this volume are devoted to the Groups 8, 9 and 10 (VIII) metals but then there is a substantial section on the Group 11 (IB) precious metals, silver and gold (54 pages plus 201 references). There is also a section of the index devoted to gold.

Included in this last part is an interesting review of the chemistry of gold with emphasis where appropriate on its unique aspects which are related to relativistic effects which are more pronounced in gold than for any other element. Gold metal has a characteristic yellow colour in bulk but when finely divided can be purple, ruby red or blue. Gold(I) and gold(III) are the oxidation states which dominate its chemistry, but examples of gold (-I), (II), (IV) and (V) systems are also given.

Aspects of gold chemistry which are described include that of its halides, gold oxide (Au_2O_3), gold complexes and organometallic compounds of gold. All gold(I) halides are known in the solid state except for the fluoride. Gold(III) fluoride, bromide and chloride are known but gold(III) iodide has not been definitely characterized in the solid state. The higher fluorides of gold, AuF_5 and AuF_7 , have been reported and the former is well characterized. Gold(-I) complexes include Cs^+Au^- and Rb^+Au^- which are ionic semiconductors. Gold(I) complexes with C-, O-, N- P-, As-, S and halogen donors have been described. Gold(II) complexes include thiocarbamates and a phthalocyanine and diamagnetic ylids. Gold(III) compounds include some with N-, P-, As and halogen ligands. A dithiolene complex which is formally gold(IV) is described, and gold(V) is represented by the low spin d^6 ion, AuF_6^- .

There is a section on gold cluster complexes. Relativistic effects in gold chemistry and the concept of aurophilicity are discussed. Many gold

complexes have unusually short Au-Au contacts in the solid state, with Au-Au distances in the range 2.7-3.3Å. There is a section on the use of silver and gold compounds in medicine, with gold being especially important in the treatment of rheumatoid arthritis. Reasons are given as to why Mössbauer spectroscopy is a valuable aid in the structural analysis of gold compounds. Mössbauer spectra with ^{197}Au can distinguish between different oxidation states, and between different coordination numbers for a given donor atom, and show whether a compound contains gold(II) or a mixture of gold(I) and gold(III).

The text is well interspersed with useful tables, formulae and diagrams and is easy to read. A broader spectrum of uses for both gold and its compounds could have been included, but the potential importance of these, including catalytic aspects, has become prominent only recently and could perhaps be included in a revised edition in due course.

David Thompson

Can you help?.....

Fatigue properties of pure gold. A reader is seeking some data on the fatigue properties of pure gold wire. Does anyone know of such data?

If you can supply any information, please contact the Editor. Any information received will be passed on to the enquirer on a confidential basis, without naming the source, if requested.