An Authoritative Reference Book

Handbook of Precious Metals

EDITED BY E. M. SAVITSKII, Hemisphere Publishing Corporation, New York, 1989, 600 pages, ISBN 0–89116–709–9, U.S.$134, £96

Anyone who seeks technical information on the metallurgy, properties and applications of the platinum group metals will welcome the publication of a new handbook on the subject. The last one, the Edelmetall-Taschenbuch, was published over twenty years ago in German.

At a time when platinum and the other platinum group metals are finding increasing industrial use, and recognising the need for an up-to-date, authoritative reference book, the late Professor E. M. Savitskii and his colleagues at the U.S.S.R. Academy of Sciences produced the "Handbook of Precious Metals" covering the platinum group metals, gold and silver. Published originally in the U.S.S.R. in 1984, an English language edition, edited by Professor A. Prince of Brunel University, U.K., is now available.

The Handbook is divided into six chapters, the first of which describes the principal ores, minerals and deposits. The section on the platinum group metals is extensive but, surprisingly, the Stillwater deposit in Montana, U.S.A., is not mentioned. Chapter 2 covers the extraction of the elements and the manufacture of semi-finished products. The brief section on the extraction of the platinum group metals is far from satisfactory and is outdated in parts, although it may reflect the current status of Soviet technology rather than that of the Western World. No mention is made, for example, of solvent extraction techniques and undue prominence is given to the Mintech process involving the use of aluminium. In contrast, the section on the manufacture of semi-finished products is more substantial and up-to-date.

The physical, chemical and mechanical properties of the precious metals and their alloys in the liquid and solid states are covered in Chapters 3 and 4, respectively. Both contain substantial sets of data on the platinum group metals, much of it from the Russian literature.

That said, the section on mechanical properties, in Chapter 4, is disappointing; no data are given for alloys of platinum and the other platinum group metals, only for the pure metals. The oxidation properties given for the precious metals are misleading, also.

The fifth chapter is the largest and it is, perhaps, the key feature of the book. A very comprehensive set of phase diagrams of the platinum group metals is presented, including ternary and multicomponent systems. This is an important reference source that will ensure the success of the Handbook.

The last chapter describes the industrial applications of the precious metals and their alloys, and includes a section on platinum group metal catalysts. As may be anticipated, this chapter is quite wide ranging and includes a section on materials for electronics. This is limited primarily to metallisation in the manufacture of semiconductors. Such limitations are also seen in other sections. For example, the one on the use of the platinum group metals and their alloys for high temperature structural applications has considerable emphasis on Soviet alloys and standards. It devotes, rightly, some space to a discussion of creep properties and the mechanisms involved, but lacks basic tensile and other data. The contribution that ZGS and other dispersion strengthened platinum alloys have made in this area receives only a passing mention; this is a serious omission for an authoritative reference book.

This Handbook is well written and will prove a useful, if not essential, addition to the bookshelf. It is not fully comprehensive nor up-to-date, and disappoints in parts. It leans heavily on Soviet literature and industrial practice which is both its strength and its weakness. It is good value, however, and is commended to the reader. C.W.C.