anyone working in this area must have access to this book, which maintains Gmelin's impeccable production standards, and has only one flaw. Its utility could have been significantly enhanced by including a ligand formula index which covered both this volume and *Supplement Volume D1*.

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Gmelin handbook of inorganic chemistry, 8th edition, *Th — Thorium, Supplement Volume D1: Properties of Thorium Ions in Solutions*, Springer-Verlag, Berlin, etc., 1988, xv + 171 pages, DM785. ISBN 3-540-93563-0.

This is the ninth volume which the Gmelin Institute has published concerning the chemistry of thorium (System No. 44), and is the second to deal with its solution chemistry (*Supplement Volume D2*, which appeared in 1985, describes aspects of thorium solvent extraction).

The fact that Th^{4+} is the largest tetravalent cation in the periodic table adds to the wealth of chemistry to be found in this volume (*D1*). However, this is balanced by the somewhat restricted data sets (e.g. for electrochemical and transport properties) which exist for thorium in comparison with uranium. The central portion of this volume (the chemical reactions of thorium in solution) reveals a considerable overlap with the contents of *Supplement Volume C7* (see following review), but the material is presented in such a manner that it is clearly complementary rather than repetitive.

The opening chapter (G. Marx; 12 pages) describes the physical properties of thorium(IV) in aqueous solution (including densities, viscosities, diffusion coefficients, activity coefficients, vapour pressure measurements, and solution thermodynamics), and is followed by a second short chapter (G. Marx; 9 pages) describing the electrochemical properties of those solutions (including standard potentials, polarography, and conductivity and mobility measurements). The third, and principal, section (S. Ahrland, P.A. Baisden, G.R. Choppin and R.A. Torres; 122 pages) describes the coordination chemistry of thorium(IV) in solution. After an excellent introduction to the principles of the complexation of actinide ions in solution (which would make a splendid text for final-year undergraduates), the hydrolysis of Th^{4+} in water is discussed in detail. Stability constant measurements for Th^{4+}(aq) with a wide range of common inorganic ligands (including halide, nitrate, thiocyanate (cf. *Supplement Volume C7*), sulfite, sulfate, etc.) are then detailed, followed by a similar (but much longer) section for organic ligands (in particular carboxylates (again, cf. *Supplement Volume C7*) and ketones). The volume concludes with a detailed coverage (26 pages; G. Marx) of precipitation and coprecipitation methods for thorium(IV), of more interest to those involved in isotope separation work than to coordination and organometallic chemists.

This volume is, as will be obvious to anyone opening it, an essential purchase for all academic libraries, as well as those of the various Atomic Energy Authorities. As usual, one cannot help but admire the high professional standards maintained by the Gmelin Institute. This volume contains a wealth of well presented tabular and graphical data, and is a credit to its authors. The only minor (indeed insignificant)

criticism that can be levelled at this volume is the use of inelegant American spelling (e.g. vapor (*sic*)). The absence of a formula index for the ligands is discussed in the following review.

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