

## BOOK REVIEWS

*Mineral Processing and the Environment* G.P. Gallios and K.A. Matis (Eds.). NATO ASI Series 2: Environment – Vol. 43. Kluwer Academic Publishers, Dordrecht, The Netherlands 1998, 403 pp., NLG 360.00, US\$195.00, GBP 123.00.

*Mineral Processing and the Environment* is the result of a summer school meeting of members of the NATO Advanced Science Institute (ASI) which was held in Varna, Bulgaria from the 18th to the 30th of August 1996. G.P. Gallios and K.A. Matis both from the University of Thessaloniki were the hosts of the meeting and are the editors of the publication.

The purpose of the meeting was to bring together 77 delegates from 18 countries throughout Western, Central and Eastern Europe to review and discuss the current and future environmental trends within the Mineral Processing industry. Four technology areas were reviewed:

1. Fundamentals
2. Environmental pollution and prevention
3. Separation processes
4. Innovative techniques

The ‘Fundamentals’ review session included papers by Sadowski which describe the hydrophobic agglomeration of fine particles as well as a detailed review by Gallios *et al.* of the electrokinetic behaviour of sulphide minerals, both of which bore little direct environmental relevance. An excellent review on bacterial leaching was provided by Gracia Frutos which covered in some detail an aspect seldom dealt with in mineral processing circles, that of the importance of an understanding of microbiological classification. However, again, the relevance to environmental issues was overlooked. Turkman and Mordogan

provided some relief with a description of the legal aspects of environmental protection and the Environmental Impact Assessment procedure in Turkey.

The session on 'Environmental pollution and prevention' covered the topic in more detail and was well represented with papers spanning pollution of the air, water and soil. Vircikova and Macala provided a review of air pollution from the Slovakian perspective. A number of minerals processing industries are reviewed and typical emission data are provided and compared to the minimum allowable levels. Of particular interest were the papers devoted to the removal of pollutants from dilute liquid effluent streams. A number of current and novel remediation techniques are discussed including electrochemical, biosorption and inorganic sorption techniques. A number of the techniques presented briefly in this session were repeated in more detail under the 'Separation processes' and 'Innovative techniques' sessions. An interesting paper is presented by Sequeira on a topic which is and will be receiving more prominence, that of waste recycling and mineral recovery. This fascinating paper provides details of a method for the recovery of nickel and cadmium from spent batteries and also alludes to the diversity of techniques and methods, which are available.

A new slant was provided to familiar separation techniques such as precipitation, ion exchange and gravity separation within the Separation processes session. For instance, the novel use of  $\text{Fe}(\text{SO}_4)_3$  instead of  $\text{Ca}(\text{OH})_2$  to precipitate arsenic pollutants from copper processing plant acid effluents is discussed, while Hudson provides a fascinating review of inorganic ion exchange media for the removal of priority pollutants such as cadmium and mercury from effluents.

The general theme of the Innovative techniques session was summed up in a paper by Morizot, which describes the dearth of knowledge and techniques which the mineral processing fraternity possesses which could be applied to a vast array of environmental pollution problems. One of the papers, which I particularly enjoyed, was presented by Frenay *et al.* in which the group describes a flotation technique for the separation of plastic waste materials. The session also included two papers which present techniques which hold enormous potential for the future environmental remediation application namely electroflotation and biosorption.

In general I felt that *Mineral Processing and the Environment* is a good publication for introducing the mineral processing fraternity to environmental issues, and it presents some excellent reviews and references. Of the 18 papers presented, roughly 60% are devoted to describing applied pollution remediation and prevention techniques, while approximately 20% describe recovery and recycling techniques. Little, however, is presented as a guide to the mineral processing scientist, engineer or technologist as to current environmental philosophy and statutory requirements as they pertain to the Mineral Processing industry. Issues such as sustainable development and environmental management are mentioned, however, I believe that in future it is essential for the personnel in the field to be more aware of these issues in order to be able to make better judgement calls when applying remediation/recovery/recycling techniques.

The proceedings are presented in a well bound hard cover edition while the format of the presentations are legible and well structured, with clear diagrams including some nice photos of the conference activities in Varna. The only criticisms are that some of the diagrams were intended for colour reproduction and may be difficult to interpret in black and white and that although the grammar is generally of a good standard, some papers may be difficult to read.

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*Handbook of Magnetic Materials, Volume 11* K.H.J. Buschow (Ed.). North-Holland, Elsevier Science, Amsterdam, The Netherlands 1998, 732 pp., ISBN 0-444-82956-3, NLG 550.00, US\$316.00.

This latest edition of the *Handbook of Magnetic Materials* presents a continuation of a fine balance between review articles of research on more basic properties of magnetic materials and on applications oriented studies. In the first category a very complete overview is given in Chapter 1 by V. Sechovsky and L. Havela of the magnetism of ternary uranium compounds which is a follow-up of their earlier review of

intermetallic actinide compounds which also covered binary compounds (*Handbook of Magnetic Materials*, Volume 4, Chapter 4 (1988)). After a short and unpretentious introduction of current understanding of the underlying physical mechanisms pertaining to the magnetism of uranium compounds, the authors review research on the following groups of uranium compounds:  $UTX$ ,  $UT_2X_2$ ,  $U_2T_2X$ ,  $U_3T_3X_4$ ,  $UT_2X_3$ ,  $UTX_n$  and  $UT_2X$ . In these compounds T is a 3d, 4d or 5d transition metal and X is an element from groups IIIB, IVB or VB like Al, Ga, In, Si, Ge, Sn, As or Sb. Also included are compounds with thorium and with transuranium elements, neptunium and plutonium. Diverse properties of these materials are discussed including their ferro- or antiferromagnetic behaviours, large magnetic anisotropy, metamagnetism, electronic properties and giant magnetoresistance. A wealth of information is contained on approximately 350 compounds, thus making this review a required reading for all researchers on actinide magnetism.

Chapter 2 on magnetic recording hard disk thin film media is written by J.C. Lodder. A short introduction to magnetic recording and storage technologies is followed by a careful description of the magnetic principles needed to understand the properties of recording materials. The various factors that need to be considered in designing recording media, preparation technologies of hard disk media, materials properties of Co–Cr-alloy thin films and details of multilayer technology are comprehensively discussed.

Rare-earth (RE)–transition metal (TM) compounds are widely used as permanent magnet materials because of their large energy products. Chapter 3 by Cz. Kapusta, P.C. Riedi and G.J. Tomka describes how nuclear magnetic resonance techniques are employed to study the  $RE_2TM_{17}A_x$  ( $A = N, C, H$ ) and  $RE_2TM_{14}B$  permanent magnet materials which were developed during the last two decades.

Chapter 4 by O. Moze deals with the application of inelastic neutron scattering to the study of crystal field interactions in rare-earth intermetallic compounds. Knowledge of the crystal field parameters is important in a description of bulk properties like specific heat, susceptibility and magnetization in these rare-earth compounds. The author confines his review to compounds with stable 4f electrons since the case of valence fluctuating materials and anomalous rare-earths have been treated elsewhere.

The Present volume is unreservedly recommended to researchers in the field of magnetic materials.

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