

BOOK REVIEW

Book Review: Arsenic: Environmental Geochemistry, Mineralogy, and Microbiology, RIMG Volume 79. Edited by Robert J. Bowell, Charles N. Alpers, Heather E. Jamieson, D. Kirk Nordstrom, and Juraj Majzlan (2014) *Reviews in Mineralogy and Geochemistry*, i-xvi+ 635 pages, ISBN 978-0-939950-94-2. <http://www.minsocam.org/MSA/RIM/rim79.html>

The book *Arsenic Environmental Geochemical, Mineralogy and Microbiology* (volume 79 of *Reviews in Mineralogy and Geochemistry*) is highly recommended to readers from a wide range of backgrounds with an interest in arsenic. The information-packed book fills an important role by providing an excellent summary of the scope of the world wide problem of arsenic in the environment together with detailed technical data and practical information concerning experimental technique.

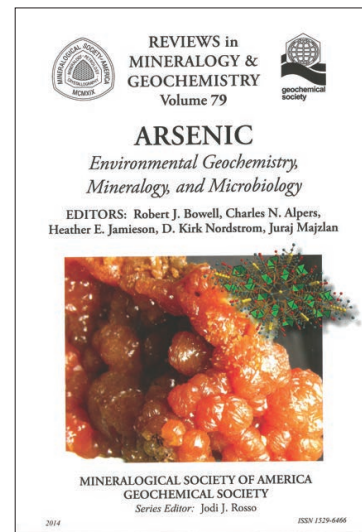
The introduction to the chapter “Health Risks Associated with Chronic Exposures to Arsenic in the Environment” (Mitchel) notes that arsenic is one of the 10 chemicals listed as a major public health concern by the World Health Organization and also places number one on a list of hazardous substances prepared by the Agency for Toxic Substances and Disease and the American Environmental Protection Agency. Readers looking for general information about arsenic in the environment and the human-health issues that result will find much to interest them in Chapter 8 and in Chapters 10–14, which are devoted to characterization and management of arsenic related to mining. The descriptive, overview nature of these chapters is based on specific mining-related examples and will appeal to wide audience, who should not be put off by the highly detailed or technical aspects of other chapters. The book is derived from a short course of the same name that was held in association with the 24th Goldschmidt Conference (June 2014) in Nevada City, California, U.S.A. Each chapter is self-contained and focuses on a specific topic. The themes of the book include: the distribution and chemistry of arsenic in its solid and aqueous forms and the interaction of these species in the environment; microbial arsenic metabolism; and health issues resulting from arsenic toxicity.

In addition to general information, the book is full of comprehensive tables of data that form a ready reference source for those researching aspects of arsenic chemistry or microbiology. In addition, there is detailed practical help for both the field and the laboratory researcher. Areas where continued or new research are needed are noted and discussed throughout the book. A detailed Table of Contents at the beginning of the book and

clear bold sub-headings within each chapter, help navigate the reader to sections of particular interest. Each chapter is supported by excellent tables and figures and has a comprehensive and up-to-date references section.

Those with a keen interest in geology will find Chapter 2, “Parageneses and Crystal Chemistry of Arsenic Minerals” (Majzlan, Drahota, and Filipipi, p. 17–184), full of the amazing variety of minerals incorporating arsenic, together with extensive detail of the crystal structures down to bond lengths and angles. The following chapter “Arsenic Speciation and Sorption in Natural Environments” (Campbell and Nordstrom, p. 185–216), is particularly valuable for those with a chemistry background and clearly sets out aspects of the chemical diversity of arsenic in aqueous media. Oxidation states are discussed together with the role of sorption and desorption in the uptake and release of arsenic in the environment. The interplay of arsenic, natural organic matter, and bacteria is presented together with resulting environmental impacts of great concern. A companion to this excellent discussion is Chapter 6, “Measuring Arsenic Speciation in Environmental Media: Sampling Preservation and Analysis” (Leybourne, Johannesson, and Asfaw, p. 371–390). This chapter is in many ways the most important in the book. Practical information on sampling techniques and the preservation of samples, particularly in the field situation, is presented. For researchers or students new to arsenic related research this chapter is essential reading. Similarly Chapter 5, by Foster and Kim, on the use of X-ray adsorption spectroscopy to determine arsenic speciation in solids, contains both the methodology of the technique and a review of the As-XAFS literature. This material is summarized in comprehensive tables at the end of the chapter.

Significant sections of the book are devoted to the interaction of arsenic with microbial systems and humans. Chapter



7, "Microbial Arsenic Metabolism and Reaction Energetics" (Amend, Saltikov, Lu, and Hernandez, p. 391–434) includes a general description along with specific techniques and data. An appendix to the chapter lists archaeal and bacteria isolates able to metabolize arsenic. The problem of human exposure to arsenic from soil exposure is highlighted in Chapter 9 (Sasta and Juhasz) with emphasis on scientific methodology and application of the results.

The last section of the book (five chapters in all) is devoted to the mining industry. Chapter 11, "The Management of Arsenic in the Mining Industry" (Bowell and Craw) gives an overview of this world wide problem. Whole chapters are devoted to specific mine sites; The Giant Mine in the Northwest Territories Canada, Empire Mine in California, U.S.A., and the Tsumeb Deposit, in Namibia. The themes developed in earlier chapters, solid and aqueous geochemistry and microbiology, are used to develop

the discussion of specific issues at the various mine sites. An emphasis on practical advice and methods of assessing and problem solving are also continued.

The book is highly recommended to researchers and students, who are commencing studies related to arsenic, as a source of information and practical help. The same holds for people seeking knowledge related to mining and the environmental problems arising from arsenic. The book should be considered as a collection of resources to be kept at hand for ready reference.

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