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9

# **Environmental Mineralogy: Microbial Interactions, Anthropogenic Influences, Contaminated Land and Waste Management**

*Edited by: J.D. Cotter-Howells,  
L.S. Campbell, E. Valsami-Jones and  
M. Batchelder*

# **Environmental Mineralogy: Microbial Interactions, Anthropogenic Influences, Contaminated Land and Waste Management**

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# Preface

The past 10 years or so have seen the emergence of a discipline known as 'Environmental Mineralogy'. This should be regarded not as a new discipline *per se*, but as a new application of traditional mineralogy. Mineralogists have always sought to understand the chemical and physical environment under which a particular mineral forms and to determine the arrangement of atoms within that mineral. The field of Environmental Mineralogy asks the same questions in a different context. For example, can minerals assist in the remediation of contaminated soils and waters? Which minerals can potentially be deleterious to, *inter alia*, buildings, ecology and human health? Which minerals are suitable as containment for waste? How does the biota interact with minerals? Environmental Mineralogy is emerging as a field that seeks to define the roles of minerals in all environmental systems, and to work towards the preservation and restoration of such systems.

Environmental Mineralogy is achieving prominence because of increasing concern regarding the environments in which we live. Mineralogists have perceived a gap in our understanding of how minerals behave in the surface environment and a need for innovative, 'green' solutions to the problems of contamination and waste. However, the emergence of Environmental Mineralogy also owes much to modern analytical technology. Many minerals in the surface environment fall within the clay-grade range and therefore, demand high-resolution systems for analysis. Similarly, trace elements are now detectable at exceptionally low concentrations in a wide variety of matrices. Further, many mineral-environment interactions need to be examined at the atomic scale for a greater understanding of the interactive processes involved. This requires the application of the latest technologies such as X-ray photoelectron spectroscopy, X-ray absorption spectroscopy and atomic force microscopy to name but a few.

The aim of this monograph is to provide an up-to-date account of the state of this diverse subject area. With chapters containing a strong review element, it is hoped that this volume will appeal to both researchers and students alike. The volume is arranged in four sections: (1) mineral-microbe interactions; (2) anthropogenic influences on mineral interactions; (3) minerals in contaminated environments; and (4) minerals and waste management. These four sections by no means give exhaustive coverage of the subject area, but communicate some of the most important developments taking place at the present time.

The editors are indebted to the referees who all put in a considerable amount of time and effort to produce thoughtful, critical reviews of the chapters. International peer review, though very time-consuming and

unrewarding for, often very busy, referees, continues to underpin scientific quality assurance for any research publication of this nature.

The basis of the volume is the group of papers which were originally presented at the Mineralogical Society's Winter Meeting 'Environmental Mineralogy', held in Aberdeen in January 1999. The meeting and hence this volume benefited from donations by English China Clays International, British Nuclear Fuels Ltd, WBB Technology Ltd and Rio Tinto plc. The editors acknowledge the contributions of the Geochemistry Group and of the Mineralogical Society officers and staff who assisted with the organisation of the meeting. Finally, the editors wish to express their gratitude to Kevin Murphy, the Mineralogical Society's Production Editor. Without Kevin's constant encouragement throughout the project, we might have given up at such a daunting task! We are grateful for all his hard work.

J.D. Cotter-Howells,  
L.S. Campbell,  
E. Valsami-Jones,  
M. Batchelder

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