



Preface

Chalcogen cycle science and technology

Chalcogens comprise the elements of group 16 in the Periodic Table. The G16 elements include oxygen, sulfur, selenium, tellurium, and polonium. The name of the group was proposed in 1932 by Wilhelm Blitz and his colleague Werner Fischer of the Institute of Inorganic Chemistry at the University Hannover, Germany. They derived the term “chalcogens”, meaning “ore formers”, from the Greek words *chalcos* – “ore” and *-gen* – “formation”, because all the elements are found in copper ores.

There remain many unresolved questions about the biogeochemical cycles of the G16 elements. While the biogeochemistry of oxygen and sulfur are relatively well known, we understand much less about the processes that control the environmental fate and ecotoxicology of selenium, tellurium and polonium. Ongoing research continuously uncovers new aspects of the cycles of chalcogens, not only in the Earth’s crust and oceans, but also in the atmosphere and in ecosystems such as the intestinal track of animals and humans. The biovolatilization of selenium, tellurium and sulfur, for instance, is now recognized to play major roles in the biological and geochemical cycles of these elements.

The G16 elements have tremendous biotechnological potential. Among many other applications, microbial and abiotic processes involving oxygen and sulfur are routinely used in the removal and containment of organic and inorganic contaminants. An example is the *in situ* precipitation of harmful metals and metalloids with sulfide produced by sulfate reducing microorganisms at polluted sites. Furthermore, in recent years, nanobiotechnological applications of G16 elements have rapidly expanded, as exemplified for instance by the biosynthesis of CdSe nanoparticles using enrichments of soil bacteria.

This special issue of the *Journal of Hazardous Materials* contains a selection of the papers presented at the *2nd International Conference on Research Frontiers in Chalcogen Cycle Science and Technology*, held in Delft (The Netherlands) on May 31st–June 1st, 2010. The 2nd edition of this conference confirmed the continued interest of the scientific community in the G16 elements. We hope this issue will be a valuable contribution to the field of chalcogen research, which ranges from basic studies on the biochemistry and geochemistry of the G16 elements to novel green chemistry applications.

We are grateful to the authors who contributed to this issue and for the valuable advice from the scientific committee and the reviewers who guaranteed the quality of the papers. We also thank the *Journal of Hazardous Materials* for providing the opportunity to highlight some of the latest scientific and technological advances presented at the conference.

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