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Foreword

Foreword to the Research Front on 'Arsenic Biogeochemistry and Health'

The dramatic situation caused by high arsenic concentrations in ground and drinking water, as well as in soils, in many regions all over the world has led to a multitude of scientific studies and publications in the past 20 years. Multifaceted and interdisciplinary research has extended our understanding of the origin, distribution and effects of arsenic. Current research focuses on predicting the behaviour of arsenic in the subsurface, developing strategies to remove arsenic from drinking water, and remediation of arsenic-contaminated groundwater.

This Research Front presents 11 contributions discussing a variety of aspects related to arsenic biogeochemistry and health. It includes research results presented in a special topic session (Arsenic: current issues of speciation, environmental behaviour, and human health impacts) at the 29th International Conference of the Society for Environmental Geochemistry and Health held in Toulouse in July 2013. The Research Front begins with an introductory review by Mühe and Kappler[1] on arsenic mobility and toxicity in the environment, which gives a broad overview of the current knowledge of arsenic biogeochemistry, exposure, health, toxicity and socioeconomic effects. Furthermore, the current research directions in predicting the presence and spreading of arsenic in groundwater, assessing its risk and potential strategies to remove arsenic from drinking water, and to remediate contaminated environments are discussed.

The following papers are organised in a way that starts with small-scale processes and ends with large-scale observations and implications, i.e. we begin with papers on biochemical processes in living organisms and end with work on the predication of the environmental behaviour of arsenic. The first two papers by Caumette et al. and Xue et al. present work on arsenic cycling in freshwater phyto- and zooplankton[2] and a study on the synthesis of arsenic containing lipids, so-called arsenolipids, in a cyanobacterium.[3] Héry et al. then show how acid mine drainage conditions release different arsenic species from streambed sediments.[4] Wovkulich et al. investigated how the injection of oxalic acid can enhance the remediation of arsenic at an arsenic-contaminated field site[5] whereas Ruzoulis et al. used an approach employing ^{13}C-labelled organic compounds to evaluate the reduction of Fe^{III} and As^{V} in arsenic contaminated sediments.[6]

The second part of this Research Front deals with studies on arsenic removal and the prediction of arsenic contamination in the environment. Corsini et al. studied the effectiveness of different sorbents and biological oxidation on the removal of arsenic from groundwater,[7] whereas Voegelin et al.[8] and Wenk et al.[9] show results for arsenic removal from water with two different kinds of household filters. Finally, Kocar et al. present new results on the prediction of arsenic in the Mekong Delta Aquifer[10] and Polya et al. provide an improved groundwater arsenic hazard map for Cambodia.[11]

The broad work presented ranges from biochemical research in (micro)organisms, laboratory and field work on arsenic biogeochemical processes to studies on the removal of arsenic using different sorbents and filter systems as well as studies on prediction of arsenic contamination in the environment. It nicely illustrates both the broadness as well as the current hot topics of this research area. It has been a pleasure to edit this Research Front and I thank all the authors for their valuable contributions to this important area of research.

Andreas Kappler
Editor, *Environmental Chemistry*

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