Arsenite oxidation by indigenous bacteria in the Bengal Delta Plain Aquifers (West Bengal, India)

DEVANITA GHOSH[1], JOYANTO ROUTH[2]* AND PUNYASLOKE BHADURY[1]

[1]Dept of Biological Sciences, IISER Kolkata, Mohanpur - 741252, Nadia, West Bengal, India
[2]Dept. of Earth Sciences, IISER Kolkata, Mohanpur - 741252, Nadia, West Bengal, India
(*correspondence: joyanto.routh@iiserkol.ac.in)

Microbial oxidation of arsenite occur in numerous phylogenetically distinct microorganisms, which play a role in As cycling by converting arsenite to the more strongly sorbing, less mobile, and toxic arsenate species[1].

We are studying biogeochemical processes associated with As cycling in Barbakpur village, Rahamatpur block, West Bengal – a region severely affected by high (up to 1 mg/l) As concentrations in groundwater. Water and sediment samples were collected to isolate microorganisms oxidizing arsenite. A new set of primers was designed based on amino acid alignments of several published arsenite oxidase subunit B (*AroB*) genes [2]. Besides, eubacterial 16S rRNA primers were also used to study the microbial communities. *AroB*-like sequences were detected in three wells. Molecular phylogeny based on *AroB* and 16S rRNA sequences reveal the presence of diverse bacterial groups. In addition, ongoing geochemical studies focus on characterizing the organic matter in sediments, which sustain these heterotrophs, arsenite speciation, and trace metal analyses [3].

[1] Evelyne Lebrun (2003) *Mol. Biol. Evol.* **20** (5):686–693. [2] William P. Inskeep (2007) *Environmental Microbiology* **9** (4), 934–943. [3] Joyanto Routh *et al* (2011) *Applied Geochemistry* **26** (4), 505-515.

Stability of phase D at high pressure and temperature: Implications for the role of fluids in the deep mantle

SUJOY GHOSH AND MAX W. SCHMIDT

Institute of Geochemistry and Petrology, ETH Zurich, Switzerland (sujoy.ghosh@erdw.ethz.ch)

Water is transported into the Earth's interior via hydrous phases in descending slabs. Numerous high-pressure studies have clarified that several dense hydrous magnesium silicates (DHMS) are stable at mantle conditions in model compositions [1, 2]. These phases act as water carriers in the subducting slab and may play a critical role in water cycling in the Earth's history and partial melting in the deep mantle. Among these DHMS, phase D is the DHMS phase hosting water in the lower part of the transition zone (where slab may travel along the upper/lower mantle boundary) carrying H_2O from the upper to the lower mantle.

In the present study, we report data on the melting phase relations of phase D and of phase D + olivine + enstatite in (i) $MgO\text{-}SiO_2\text{-}H_2O$ system (ii) with Al_2O_3 and (iii) with Al_2O_3 + FeO added in proportions appropriate for the mantle. Stochiometric oxide mixtures of brucite and quartz of phase D composition were used as starting material. Multianvil experiments were carried out at pressures between 22 and 24 GPa at temperatures between 1000 and 1800 ºC using 10/3.5 pressure assembly.

Our data show that phase D decomposes to MgSi-ilmenite + stishovite + melt or MgSi-perovskite + stishovite + melt and indicate that phase D can be stable along a slab geotherm up to the base of the upper mantle for a range of H_2O contents. Melt compositions are strongly magnesian with Mg:Si ratio of 1.5-5.2. Furthermore, mass balance calculation of the phase D composition experiments (with Al, Fe) compostion suggests that melts can contain ~ 34 wt% H_2O which fits well with EPMA analysis. The data are used to determine the stabilty of phase D, the proportions of melt formed during melting, the composition of the partial melts and the variation in the melt composition at different pressure temperature conditions. Upon thermal relaxation (to adiabatic temperatures)of a slab travelling along the 660 km discontinuity, phase D would melt releasing a H_2O-rich magnesian melt from the slab. At present experiments at 32 GPa are under way to constrain the P-T slope of the melting.

[1] Shieh, S. R., Mao, H. K., Hemley, R. J., Ming, L. C., 2000. *EPSL* **177**, 65-80. [2] Frost, D. J., Fei, Y., 1998. *JGR* **103**, 7463-7474