# Bacterial physico-chemical controls on As-Pb iron hydroxy sulfates in reduced environments

C.G. WEISENER[1]* , C.M. SMEATON[1], G.E. WALSH[1], A.M.L. SMITH[2,3,4], E.C. FRU[1] AND B.J. FRYER [1]

[1]Great Lakes Institute for Environmental Research, University of Windsor, ON, Canada (*weisener@uwindsor.ca)
[2]Dept. of Mineralogy, The Natural History Museum, Cromwell Road, London, SW7 5BD, UK
[3]Davy Faraday Research Laboratory, The Royal Institution of Great Britain, 21 Albemarle Street, London, UK
[4]Dept. of Earth and Planetary Sciences, Birkbeck, University of London, Malet Street, London, WC1E 7HX, UK

We recently demonstrated the intracellular precipitation of Pb by *Shewanella putrefaciens* CN32 during the reductive dissolution of Pb-jarosite [1]. In the present study, we build upon earlier research which focused on the abiotic dissolution of Pb-As-jarosite [2]. In this study we examine the reductive dissolution of Pb-As-jarosite ($PbFe_3(AsO_4)(SO_4)(OH)_6$) by bacteria under anaerobic circumneutral conditions. Microbial biomass, SEM, ATP, [Pb] and solution chemistry including As and Fe speciation were monitored over time to assess the influence of *S. putrefaciens* on As-Pb jarosite. The work will discuss the rates of Fe reduction versus As reduction and the fate of Pb providing new insight into Pb, Fe and As biogeochemical cycling in reduced environments.

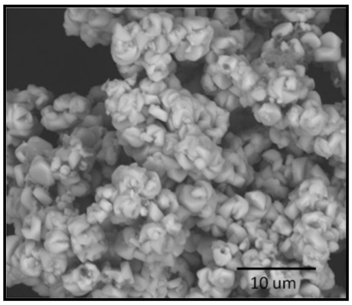

**Figure 1:** a) SEM image and b) EDS spectra of Pb-As-jarosite

[1] C.M. Smeaton *et al*., (2009) *Env. Sci. Tech.* **43**, 8091-8096. *Journal*, **25**, 415- 421. [2] A.M.L. Smith *et al*., (2006) *Chemical Geology*, **229**, 344-61.

---

# High-Mg carbonatitic HDFs, kimberlites and the SCLM

Y. WEISS[1]*, W.L. GRIFFIN[2], D.R. BELL[3] AND O. NAVON[1]

[1]The Institute of Earth Sciences, the Hebrew University of Jerusalem, Israel (*yakov.weiss@mail.huji.ac.il)
[2]GEMOC, Macquarie University, NSW, Australia
[3]School of Earth and Space Exploration, Arizona State University, AZ, USA

Trace-element patterns of high-Mg carbonatitic high-density fluids (HDFs) trapped in Siberian fibrous diamonds are similar to those of Group I kimberlites, but are slightly more fractionated. The patterns of both are comparable in shape to the average pattern of peridotite xenoliths from the sub-continental lithospheric mantle (SCLM) [1].

Possible scenarios for explaining these similarities include mixing, fractionation and melting:

1) Adding 2.5% of kimberlitic magma or 0.7% of the Siberian high-Mg HDFs to a highly depleted peridotite closely reproduces the SCLM pattern.
2) The formation of the high-Mg HDFs through fractionation of kimberlitic magma calls for 70% crystallization of olivine, pyroxene garnet and carbonate. However, the alkalis and Ba of the calculated fluid are too low and the middle to heavy REE, Zr, Hf, Ti and Y are too high compared to the Siberian high-Mg HDFs.
3) Simple batch melting of 0.5% of a source with average SCLM modal abundance and trace-element composition closely reproduces the trace-element pattern of the Siberian high-Mg HDFs. Higher degrees of melting (~2%) of the same source yield patterns similar to those of Group I kimberlite.

High-Mg HDFs in diamonds from Kankan, Guinea have major-element compositions comparable to that of the Siberian high-Mg carbonatitic HDFs. However, they are depleted in K, Rb, Cs, Nb and Ta and enriched in Ba, Th, U and LREE relative to the Siberian ones. These differences closely correspond to those between the patterns of Group II and Group I kimberlites, respectively. Extending the melting scenario to the Kankan HDFs and Group II kimberlites, the two can be produced by 0.2 and 1% melting of SCLM that carries phlogopite (0.3% and 0.1%, respectively) and a trace of rutile.

Whether it is mixing, melting or combination of both, the new constraints indicate a very close genetic relation between high-Mg carbonatitic HDFs, kimberlites and the average SCLM.

[1] McDonough (1990) *EPSL* **101**, 1-18.