

Salinity of ore-forming fluids in high-sulfidation epithermal systems: New infrared microthermometric data of enargite-hosted fluid inclusions

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Fluid inclusions were studied by infrared microthermometry in representative enargite samples collected in different high-sulfidation epithermal deposits from a Miocene metallogenic belt in the Peruvian Andes, and from the Late Cretaceous Timok-Srednogorie belt of southeastern Europe. The aim was to constrain the salinity of fluids trapped in enargite, with carefully controlled low intensity infrared light source, since a previous study revealed that light intensity is a critical setting during infrared microthermometry, which may dramatically affect salinity estimates [1]. Most of the newly acquired salinity data fall systematically below 5 wt% NaCl equivalent, and the homogenisation temperatures range between 150 and 290°C. Where quartz and enargite coexists in a given locality, similar microthermometric data were obtained for inclusions trapped in both phases. The bulk of the enargite fluid inclusion data obtained in our study overlaps with microthermometric data, especially low salinities, gathered in previous studies in enargite and quartz of the gold-event in other major high-sulfidation epithermal deposits.

Our study shows that the problems of salinity overestimates outlined previously can be reduced, becoming even negligible, if care is taken to work with appropriate low light intensities and nearly closed diaphragms during microthermometry. The drawback is the reduction of the number of inclusions, which can be studied. Our study supports the models, which link the origin of ore-forming fluids in high-sulfidation epithermal deposits to low salinity magmatic fluids formed in the deeper porphyry environment, i.e. contracted magmatic vapour or unseparated magmatic fluid, and is in agreement with the low salinity nature of fluids, which preferentially transport Cu, Au, As and S from deep magmatic environment to shallow epithermal systems. The low salinity of fluid inclusions in enargite, speaks against the involvement of magmatic brines as predominant ore-fluids during the formation of high-sulfidation deposits.

[1] Moritz (2006), *J. Geochemical Exploration* **89** 284-287.

Stable isotope fractionation of *n*-alkanes during anaerobic degradation by *Desulfoglaeba alkanexedens*

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Desulfoglaeba alkanexedens is an anaerobic sulfate-reducing bacterium that degrades *n*-alkanes in the range of C₆-C₁₂ using an initial fumarate addition mechanism [1-2]. The glyceryl-radical enzyme catalyzing this reaction is known as alkylsuccinate synthase, or (1-methylalkyl)succinate synthase [3-4]. Stable isotope fractionation by glyceryl-radical enzymes has previously been characterized during the degradation of aromatic hydrocarbons such as BTEX compounds [5]. In this study, we investigated carbon and hydrogen fractionation of hexane and octane by *Desulfoglaeba alkanexedens*. Carbon and hydrogen enrichment factors (ϵ) for hexane were -5.52‰ and -43.14‰, respectively. The comparable enrichment factors for octane were -5.19‰ and -27.77‰. These values reflect a greater degree of fractionation than those previously reported for anaerobic BTEX biodegradation. It remains to be determined if the ϵ values associated with alkane metabolism in this organism reflect observations from the field. However, this study may indicate that different ϵ values need to be used to assess and monitor biodegradation in anaerobic, *n*-alkane vs BTEX-contaminated environments.

[1] Davidova *et al.* (2006) *IJSEM* **56**, 2737-2742. [2] Davidova *et al.* (2005) *AEM* **71**, 8174-8182. [3] Callaghan *et al.* (2008) *Biochem. Biophys. Res. Comm.* **366**, 142-148. [4] Grundmann *et al.* (2008) *Environ. Micro.* **10**, 376-385. [5] Morasch *et al.* (2004) *AEM* **70** 2935-2940.