CO_2 sequestration and extreme Mg leaching in serpentinized peridotite clasts of the Solund Devonian Basin, SW-Norway

A. BEINLICH[1]*, A. AUSTRHEIM[1], J. GLODNY[2], M. ERAMBERT[1] AND T.B. ANDERSEN[1]

[1]Physics of Geological Processes (PGP) and Department of Earth Sciences, University of Oslo, Norway (*correspondence: andreas.beinlich@fys.uio.no)
[2]Deutsches GeoForschungsZentrum Potsdam, Germany

Within the conglomerate of the Solund Devonian Basin, SW-Norway, boulders and pebbles of ultramafic origin account in places for up to 20 vol.-% of the clast population. They show a concentric build-up with green to grey coloured cores surrounded by mm to 10 cm thick zones of red to black shades. Based on textures, the following alteration sequence can be outlined: An early stage is represented by serpentinized peridotite showing a typical mesh texture, with veins of serpentine and Ni-rich hematite surrounding compartments of relic olivine (Fo_{90}) and its Mg-depleted alteration product (clay). In the more advanced ophicarbonate stage, cells are filled with calcite, quartz, and talc. In the most advanced stage, quartz, calcite, and hematite dominate and occur together with minor amounts of chromite, talc, and chlorite. The textural evolution is coupled with a decrease in whole-rock Mg from 40 to 2 wt.-% and a Ca increase from 1 to 35 wt.-%. All clasts are characterized by low Na and K and high Cr (1000-4000 ppm) and Ni (500-3000 ppm). The chemistry and textures indicate that the described clasts evolved from peridotite due to extreme Mg-leaching, development of secondary porosity, and infill of carbonates. Mg removed from the clasts is in part consumed by replacement reactions in the vicinity of the clasts where Fe-minerals (almandine) are altered to Mg-minerals (talc). Calculated apparent $^{87}Sr/^{86}Sr$ ratios of the clasts at 385 Ma (the inferred age of deposition and incipient clast alteration) range between 0.7124 and 0.7139 and are compatible with alteration by diagenetic basinal brines but rule out simple interaction with seawater. In basins where peridotite represents an important source rock the outlined process will influence the CO_2 and Mg budget.

Periodic precipitation of pyrite bands in anoxic marine sediments

R. BEKTURSUNOVA* AND I. L'HEUREUX

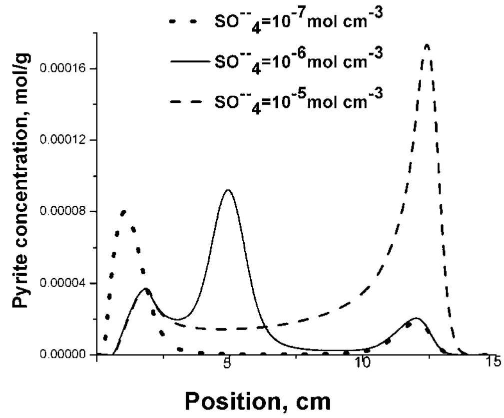
University of Ottawa, 150 Louis Pasteur, Ottawa, K1N6N5, Canada (*correspondence: rbekt101@uottawa.ca)

An early diagenetic model [1] is used to study the formation of periodic precipitation patterns (Liesegang bands) of pyrite deposits in an anoxic marine sediment system. For example, such deposits are observed in sapropel sediments of the Eastern Mediterranean [2].

The set of governing equations consists of partial nonlinear extensively coupled diagenetic equations [3] together with a periodic precipitation model that incorporates pyrite nucleation and growth [4].

The results of the work demonstrate the driving role of organic matter, its content and reactivity, as well as the pH level. Analysis shows the influence of sulfate and dissolved iron concentration on the number of pyrite bands and their distribution over the sediment layer.

Conditions favoring the formation of the Liesegang pattern are considered (Fig. 1). The work shows a qualitative agreement with Allen's experiments on authigenic pyritization



[5].

Figure 1: Pyrite concentration spatial profile for various sulfate concentrations at the origin.

[1] Berner (1980) *Early Diagenesis. A Theoretical Approach*, Princeton University Press. [2] Passier *et al.* (1996) *GCA* **60**, 751-763. [3] Boudreau (1996) *Comp&Geoscience* **22**, 479-496. [4] L'Heureux (2008) *Phys. Lett. A* **372**, 3001-3009. [5] Allen (2002) *Chemical Geology* **182**, 461-472.