Simulating Precambrian banded iron formation diagenesis

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Sedimentary rocks as old as 3.8 billion years, such as Precambrian banded iron formations (BIFs), offer a unique archive of key past chemical and biological processes. Yet, post-depositional alterations such as diagenesis can alter these sediments and make accurate interpretation of primary processes challenging. Fe(II)-oxidizing bacteria have been proposed as key contributors to BIF deposition. One main challenge to this proposition is to understand how temperature/pressure diagenesis transforms biogenic Fe(III)(hydr)oxides formed by these bacteria.

We present diagenetic experiments of the transformation of precursor Fe(III) minerals associated with microbial biomass. Mixtures of ferrihydrite (biogenic ferric oxyhydroxide mineral proxy) and glucose (microbial biomass proxy) were incubated in gold capsules at 1.2 kbar and 170ºC. Key BIF minerals are produced by electron transfer from organic carbon to Fe(III) minerals during this diagenesis. Ferrihydrite transforms to hematite, magnetite, and siderite. Silica-coated ferrihydrite mixed with glucose yields hematite and siderite. Spheroidal siderite, a structure found in IF, forms depending on the Fe(III):C ratio of primary ferrihydrite-biomass sediment. Our results thus suggest that post-depositional BIF mineralogy does not directly archive the oceanic or atmospheric conditions during their lithification. Furthermore, we argue that spherical to rhombohedral siderite structures in deep-water Fe-oxide IF can be used as a biosignature for photoferrotrophy, whereas massive siderites reflect high cyanobacterial biomass loading in highly productive shallow-waters.

The platinum group and precious metals contents of Muğla-Ortaca Area Chromites

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The study area is located in Menteşe Region, which is called Taurus belt, Southwest of Turkey. Structural units in the area are Menderes Massive, Western Taurus Nappes, Beydağları Autochthonous and Antalya Nappes.

In general, region consists of from bottom to top allochthonous units, peridotite nappe and alluvium. Allochthonous units, include Jura aged limestone interlayered with calciturbidite. The Upper Cretaceous aged complex consist of limestone with micritic texture and marn which is formed intermediate layers.

The peridotitic unit is composed of serpentinite, serpentinized dunite, dunite and harzburjite and it is Cretaceous aged. Also Quaternary alluvium is located at the top of the peridotites.

In this study, in order to determine the geochemical and petrographic characteristics (ore and rock) major, trace and rare earth elements were analyzed around Muğla-Ortaca.

The distribution of platinum group elements for Zimparalik shows according to geochemical analyses that Pt content is between 10 ppb and 147 ppb, Pd content is between 6 ppb and 54 ppb and Ir content is between 12 ppb and 131 ppb. In additon, Au content is between 24 ppb and 135 ppb in this area.

The samples from Yemislik show that Pt content changes between 30 ppb and 138 ppb, Pd content is approximately 8 ppb, Ir content changes from 10 ppb to 100 ppb and also Au content reaches to 205 ppb.

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