

STEPS Students Report

Geochemical studies of Upper Jurassic carbonate rocks of Abalak formation from the Central West Siberia

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Carbonate rock samples of Upper Jurassic age were brought from Moscow for detailed geochemical investigations in the laboratory of Marine Analytical Chemistry (AORI). The samples were studied using optical microscope, Scanning Electron Microscope (SEM), Laser-ablation ICPMS, Electron Probe Microanalyzer, (EPMA), Nano-SIMS.



During the internship new methods of probes preparation for the analysis have been studied. Literature about the analytical methods, laboratory techniques and its fields of application has been provided by the host professor and laboratory scientists.

Elemental mapping has been carried out using EPMA, LA ICP-MS and Nano-SIMS. Differences in the major and minor elements within the rocks matrix, vein calcite, different types of pyrite precipitates were observed. Pyrite crystals of different morphologies have been distinguished using SEM: large, often cubic, in the main pyrite mass; pyrite framboids in the limestones matrix; pyrite filling organic remains. Sulphur stable isotopes distribution ($\delta^{34}\text{S}$) in pyrite crystals of different types has been analyzed (fig.1). In several samples imaging of sulphur stable isotopes



distribution has been carried out using Nano-SIMS.

As a result according to morphologies and sulphur stable isotopes distribution different genetic types of pyrite have been subdivided: 1) biogenic – formed as a result of microbial sulphate reduction in sediments (framboids and filling organic remains, strongly enriched in light S isotope); 2) chemogenic – formed

at later stages of lithogenesis (large cubic crystals of pyrite relatively enriched in heavy S isotope).

These results prove and complement previously proposed theory about biogenic origin of the carbonate rocks and their secondary alterations under influence of hydrothermal fluids.

Upper Jurassic carbonate rocks of Abalak formation represent the oil reservoir in the Central West Siberia. Its genesis is still uncertain. Study of the carbonate rocks origin is important for predicting the reservoirs distribution.