

Geochemistry of organic matter from Triassic U-bearing sandstones of Peribaltic Syneclise (N Poland)

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In central parts of the Peribaltic Syneclise, Triassic rocks display sandstone type uranium mineralization. Mineralization is related to gray sandstones poor in TOC.

5 samples were covered by geochemical studies, including TOC, bitumen fractions, saturated hydrocarbons and aromatic hydrocarbons.

Small TOC values (below 0,1%) indicate poor hydrocarbon generation potential. Amounts of bitumens are small, from 70 to 170 ppm. The share of hydrocarbons in these bitumens ranges from 26,7% to 52,3%, being lower than that of the asphaltene and resin fraction. Migration coefficient of hydrocarbons is raised, ranging from 0,03 to 0,09, which suggests epigenetic origin of labile components. N-alkanes with 21 – 24 carbons in chain are most common, suggesting that the organic matter is of the sapropel type. Analyses of compounds of the terpane group showed predominance of pentacyclic compounds over the tricyclic, indicating high share of bacteria in original organic matter as well as low level of maturation. The composition changes in lower part of the studied series. In that part, tricyclic compounds predominate over the pentacyclic which indicates a higher level of maturation. Moreover, difference between contents of 17 α (H)-trisorhopane (Tm) and 18 α (H)-trisorhopane II (Ts) compounds which further supports higher level of maturation of the studied organic matter. C27 (cholestane) appears fairly common in the group of identified steranes but content of sterane C29 sterane (stigmastane) is higher which suggests some contribution of terrigenous material in organic matter. Significant share of C28 compound (ergostane) was found in lower part of the studied series which evidences presence of material of the lacustrine origin.

The Triassic rocks are poor in TOC and their hydrocarbon generation potential is very low. At the same time they yield small amounts of labile components which would be epigenetic origin. The organic matter was generally of the marine origin. In lower part of the rock series, the parent organic matter comprises material of the lacustrine type, and in the upper – organic matter of the marine type is enriched with supposedly allochthonous terrigenous material.

A microscopic and ToF-SIMS study on the Ra uptake by barite

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Long-term safety assessment studies of nuclear waste repositories for spent nuclear fuel commonly consider a scenario, in which radium released from the fuel comes into contact with an aqueous solution saturated with barium [1]. An open question is whether a Ra containing solution will equilibrate with solid BaSO₄ under repository relevant conditions due to complete recrystallization. Previous studies have indicated that uptake of Ra is not limited by pure adsorption at close to equilibrium conditions but involves a significant fraction of the bulk solid [2,3]. So far, only macroscopic data indicate that barite may fully recrystallize to radiobarite. For this microscopic (SEM) and ToF-SIMS study, samples of two different barites were prepared in batch sorption experiments to investigate the recrystallization of barite in the presence of Ra. Based on gamma spectrometry, it was observed that one barite incorporates Ra faster than the other barite.

A broad grain size distribution was determined via SEM observation for the fine grained barite. During recrystallization of the crystals, an additional effect on the grain size evolution due to the presence of Ra was detected compared to the coarsening of a blank sample due to Ostwald ripening. In contrast, the narrow grain size distribution of the coarse grained barite didn't show significant changes with time and no influence of the presence of Ra. Here, morphological changes were observed instead.

The results of ToF-SIMS indicate a homogeneous uptake of Ra into the crystals. After 443 days the integrated Ra concentration corresponds with the size of the barite particles. The Ba/Ra ratio was calculated from several ToF-SIMS measurements. The Ra/Ba intensity distribution has its maximum between 2 and 4 · 10⁻³, corresponding well with the macroscopic results from bulk solution chemistry.

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[3] Curti, E. *et al.*: *Geochim. et Cosmochim. Acta*, 2010, **74**, 3553-3570.