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EFFECTS OF THERMAL LOAD ON BEHAVIOR OF CHERKASY BENTONITE AS A BUFFER MATERIAL

The Ukraine a DGR concept considers the crystalline rock environments. The solution is based on the multiple barriers principle. The most common buffer material for engineered barrier system (EBS) is compacted bentonite, which features low permeability and high retardation of radionuclide transport. The task "Influence of temperature on clay-based material behaviour"of the EURAD project aims to develop and document improved thermo-hydro-mechanical understanding of clay-based materials (host rocks and buffers) exposed to high temperatures (>100℃) or having experienced high temperature transients for extended durations. Establishing the thermal limit for bentonite in a nuclear waste repository is a potentially important, as the thermal limit plays on a major financial challenge requiring long-term strategic planning for used fuel management. Characterization of long-term mineralogical changes for EBS concerning the long-term geological evolution is needed for safety assessment purposes. To test the suitability and predicted functions of bentonite-based buffers under simulated repository conditions and to assess geochemical changes in minerals and porosity variations, thermal dehydration studies of bentonite were carried out at the temperature 150℃ in "dry"and "wet"conditions. Commercial calcium bentonite (PBA-22 «Extra») was chosen as clay component of the buffer materials as less sensitive for saline rock water. The expected porosity enhancement and reduction as a result of mineral dissolution and precipitation, respectively, have been evaluated in experiments with elevate temperature in autoclave. Total surface area measurements show decreases with increasing of treatment temperature for this range. The decrease in cation exchange capacity also displays with increasing temperature. The connection between structural peculiarities of bentonite, and processes of heat treated is considered. The montmorilonite indicates changes induced by dehydration with temperature, there are change and a decrease of the XRD profile intensity with heating to 150℃. The predicting evolution of bentonite behavior so as the degree of montmorilonite hydration is a very important parameter for cation behavior as a function of the thermal load. Further studies will be focused on heat effects on hydrothermal alteration of bentonites on permeability and swelling pressure.

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