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Pore space modification in bentonites subjected to low hydrothermal treatment

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Bentonites are chief candidates for engineering barriers in nuclear waste repositories. These smectite-rich rocks are generally considered to be of excellent sorption properties due to the large specific surface area. Extremely low permeability due to swelling after being hydrated is another favourable property. In our experiment, we focused on the effect of long term (1, 2, 3, 6, 9, 12 and 18 months) of hydration by using different types of "synthetic" ground water (enriched in potassium and/or magnesium) and real ground water. The experiments were conducted on two types of bentonites (Fe-montmorillonite rich bentonite from Rokle deposit and FEBEX bentonite from Spain) under normal laboratory and elevated (95°C) temperature. After the experiments, the detailed analyses of mineralogical changes and pore space were conducted. Although no mineralogical changes were recorded, the treated material exhibited substantial changes in pore space, respectively specific surface area. Each of the studied material shows distinct response: the Rokle bentonite experienced drop in the specific surface area of mesopores over 33 % (but the micropores remained unchanged), the FEBEX bentonite shows similar changes but namely for the micropores. These can be probably explained by presence of specific species of smectites in each of the studied bentonites.