# 15-year experiments of the interaction of the compacted bentonite, copper canister and fresh water

J. JÄRVINEN[1]*, M. TILJANDER[2], M. MATUSEWICZ[1], P. RAJALA[1], M. OLIN[1], M. ITÄVAARA[1] AND A. MUURINEN

[1]VTT technical research center of Finland, Otakaari 3, Espoo, Finland, Joonas.Jarvinen@vtt.fi
[2]GTK, Espoo, Finland, Mia.Tiljander@gtk.fi

Sodium bentonite is planned to be used as buffer material in KBS-3 method for final disposal of spent nuclear fuel. Therefore, the long-term stability and reactions have to investigated in all kinds of possible conditions.

The interaction of compacted sodium bentonite with low salinity groundwater simulant and copper canister was studied under aerobic and anaerobic conditions during 15- year experiments. The experimental arrangement consist of the compacted Na-bentonite (MX-80) enclosed in a copper cylinder allowed to react through a steel sinter with the solution outside.

After dismantling, the chemical composition of the bentonite and external water, microstructure of the bentonite, microbes in bentonite, external solution, copper surfaces, and minerology of the bentonite were studied.

The results of the mineralogy and chemical changes in bentonite are presented in this paper. The results were compared with the initial situation and dismantled experiments after 10 months [Muurinen et.al. 1996].

The main chemical processes, like dissolution of gypsum and calcite, exclusion of anion products from bentonite and exchange of cations (calcium with sodium) were observed to occur during 10 months interaction. [Muurinen et.al. 1996].

The main observations between 10 months and 15 years were copper diffusion in bentonite, precipitation as cuprite and malachite in bentonite, and replacing partly other cations as exchangeable cations in the experiments under oxic contitions. The amount of the carbonates increased in external water, and calcite and siderite were observed in bentonite after 15 years. The content of the sulphate in bentonite indicates that fraction of these elements may occur as minerals, even after 15 years of contact with water.

[1] A.Muurinen, J.Lehikoinen, A.Melamed & P.Pitkänen, 1996. Chemical interaction of fresh and saline waters with compacted bentonite. VTT Research Notes 1806.