# STRUCTURAL TRANSFORMATION OF GARFIELD NONTRONITE DURING INTERACTION WITH METALS

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Smectite-metals interactions have been studied with the aim to predict the reactivity of clayey engineered barriers with the metallic container used for the radioactive waste confinement. Recent results (Lantenois, 2003) have shown that metallic iron reacted in contact with Garfield nontronite to form magnetite. This result has been obtained under acidic pH conditions at 80°C during 45 days. During this reaction, clay sample was not transformed.

In this work we present the results obtained with zinc, cobalt, nickel and magnesium metal after interaction with the Garfield nontronite

$(Na_{0.05}Ca_{0.23}K_{0.01})(Fe^{3+}_{1.86}Al_{0.18}Mg_{0.02})(Si_{3.5}Al_{0.49})O_{10}(OH)_2$.

Experiments have been performed with a 1/2/50 ratio for the clay / metal powder / MilliQ water. The pH of the solutions has been fixed at 5 with HCl added. The mixture has been placed in a Teflon reactor and heated at 80°C during 45 days. After the reaction, solids and solutions have been separated by filtering. Solutions have been analysed by ICP-AES and solid phases have been characterised by XRD and infrared spectroscopy. The results:

• XRD pattern analyses show that nontronite reacted with the metals. Oxides or hydroxides have been identified. A modification of smectite has always been observed: after the reaction, the position of 00ℓ reflections is modified. The 001 reflection shifts from 15.2 Å to 14.4 Å and new 00ℓ reflections appear at ≅ 7.3 Å, 4.85 Å and 3.68 Å. This new phase is not hydrated and has no swelling property with ethylene-glycol.

• FTIR patterns show that OH stretching bands of Garfield nontronite are always present after the reaction. For all metals, OH bands appear between 3625 and 3660 $cm^{-1}$, they are probably characteristic of the presence of brucitic $M(OH)_2$ layer. These positions are not characteristic of the brucite phase. The localisation of brucite layer in the interlayer space of Garfield nontronite can explain this band.

The results obtained during the interaction between Garfield nontronite and metallic iron are totally different with other metals such as magnesium, cobalt, nickel or zinc.

## Reference

LANTENOIS, S. (2003): Iron metal/smectites reactivity in aqueous solution at 80°C. PhD thesis, Université d'Orléans.