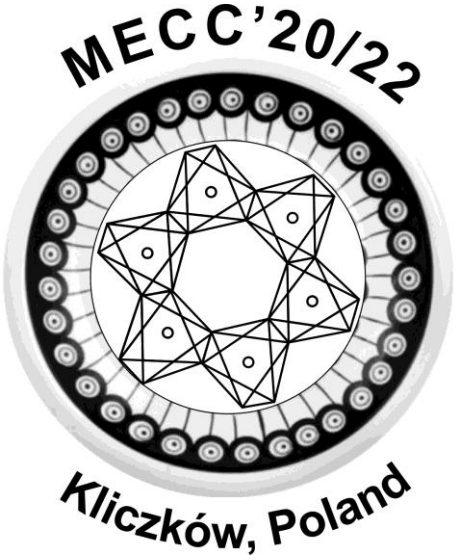
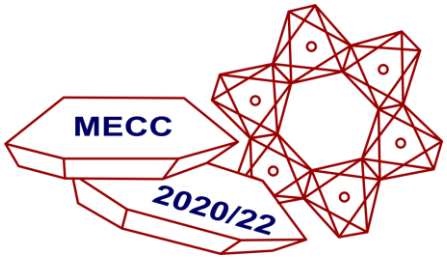
10th Jubilee Mid-European Clay Conference



BOOK OF ABSTRACTS



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The mechanisms of V(V) interactions with Mg/Al and Mg/Fe LDH with various interlayer anions

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Layered double hydroxides (LDHs) have maintained enduring popularity in many areas of science. The multitude of possible applications makes the structure of these materials more and more studied. The brucite-like layers of LDHs and their interlayer show large variation in their chemistry. Thus, it is essential to get insight into layer-anion and surface interactions of LDH. Interactions between LDHs and the V(V) anionic form are important because of the LDHs application as adsorbents for the treatment of V(V)-containing industrial waters. Moreover, the V(V)-intercalated LDHs show promising activity as catalysts. Therefore, in this work, the mechanisms of V(V) adsorption on Mg/Al and Mg/Fe LDH with different interlayer anions (carbonates, sulfates) were studied.

The materials were obtained via the co-precipitation synthesis. Their maximum adsorption capacity and kinetics of V(V) removal were tested. Depending on the brucite-layer and interlayer chemistry, discrepancies of V(V) removal efficiency and rate were observed. However in all cases the results showed a good fit to the Langmuir isotherm and pseudo-second order equation indicating the chemisorption. The non-electrostatic model (NEM) was applied to the results of potentiometric titration of the materials and the adsorption edges calculations based on the pH-dependent adsorption experiment. The NEM model showed a different number of active sites for the materials and indicated formation of monodentate vanadium complexes. The latter dominated on the LDH surface after the adsorption process. Solid-state analyses confirmed the presence of V on the surface of the materials after experiments. In particular the XPS enabled to distinguish the oxidation state of vanadium and confirmed a partial dissolution of the materials which was in line with the chemical analysis.

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