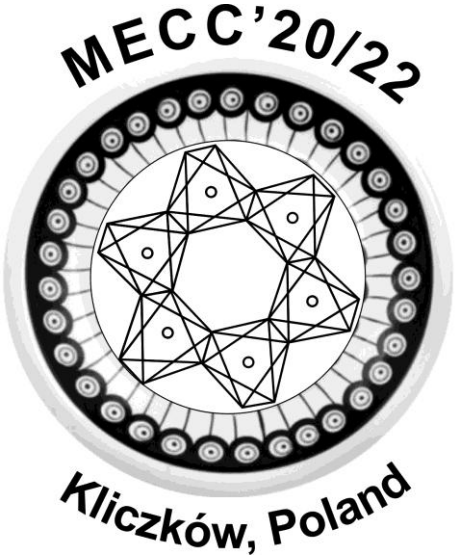
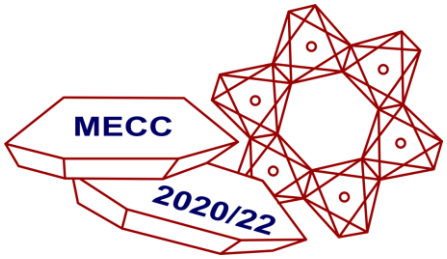
10th Jubilee Mid-European Clay Conference



BOOK OF ABSTRACTS



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Simultaneous removal of As(V) and safranin O dye by Mg/Al LDH-zeolite heterocoagulated materials in static and dynamic conditions

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In recent years, layered double hydroxides (LDHs) have been intensively investigated as components of hybrid materials. For instance, the combination of LDH and zeolite induces dual adsorption properties, thus providing a simultaneous removal of both anionic and cationic pollutants from aqueous solutions. Such approach enables the reduction of adsorbent production costs. Additionally, it allows to overcome the limitations of individual components in terms of their adsorption properties while retaining their benefits.

This study investigated the synthesis of LDH-zeolite heterostructures via two approaches: (i) facile, one pot hydrothermal method (resulting in HM samples) and (ii) co-precipitation of LDH on the hydrothermally derived zeolite (CM samples). Due to high availability and low-cost, kaolin group minerals were used for the zeolite synthesis. The structure, texture, surface morphology and chemical composition of obtained materials were characterized by XRD, FTIR, SEM-EDS, thermal analysis, N_2 adsorption/desorption and XRF. The adsorption efficiency of HM and CM hybrid materials was compared both in single and dual systems containing As(V) anions and/or cationic dye – safranin O (SO). The high S_{BET} values of HM samples positively affected their external cation exchange capacity (ECEC). Therefore the superior SO removal properties were observed. All of the obtained samples were efficient in As(V) removal, which was related to their anion exchange properties (AEC) observed in a range of 56.5-120.4 meq/100 g.

One of the most effective HM materials was transformed into hydrogel beads using a natural, biodegradable polymer – sodium alginate. The obtained granules were tested in a custom-made flow-through column. In addition to the efficient As(V) and SO adsorption, the dynamic experiments emphasized the significance of the physical behavior of the alginate beads in the fixed bed.

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