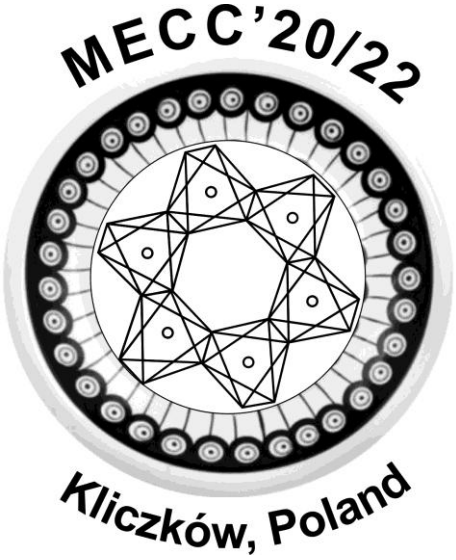
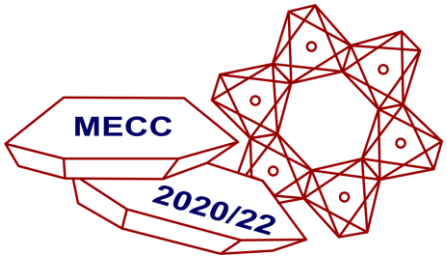
10th Jubilee Mid-European Clay Conference



BOOK OF ABSTRACTS



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Kaolinite madness - 1:1 layered structure which reveals its potential for synthesis of next generation materials

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Kaolinite is the most common member of kaolin group minerals. It is also the most abundant clay mineral with worldwide consumption exceeding 35 million tons per year. This 1:1 layered aluminum silicate devoid of significant structural charge was regarded as a non-swelling clay mineral. Therefore initially its modification was challenging and its interlayer chemistry was less developed than for smectites.

That has changed after first successful intercalation of potassium acetate into the kaolinite structure. After that, several new materials have been synthesized using 1:1 layered structures as building blocks. The most interesting materials were synthesized via grafting involving reaction of the inner-surface OH groups with various organic compounds e.g.: alcohols, organosilanes, aminoalcohols and ionic liquids. The grafted materials show increased chemical and thermal stability in contrast to intercalation compounds. Such reactions were possible due to kaolinite's asymmetric interlayer environment in contrast to symmetric 2:1 layered structures. The functionalization led to the synthesis of materials with a wide variety of properties and potential applications. Some examples include: selective adsorption, catalysis, polymer-clay nanocomposites, sensing applications, photodegradation of pollutants, luminescence, drug delivery applications as well as synthesis of heterocoagulated mineral hybrids. The tuning of the 1:1 layers also allows to control kaolinite's morphology to obtain halloysite-like nanotubes of mesoporous texture.

The lecture will provide a brief summary of findings regarding the hybrid organo-inorganic materials based on kaolin group minerals which were reported in the last decades. Moreover, some future perspectives will be highlighted.

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References

Matusik, J. (2016): Organo-functionalized kaolin-group minerals: synthesis, structure and properties. In: Beall, G. (ed.): The Clay Minerals Society Workshop Lecture Series, vol. 20: Surface Modification of Clays and Nanocomposites, 3, 1-12, ISBN: 978-1-881208-44-0.