

Characterization of synthetic lamellar inorganic solids for the study of their acid properties

Context

Clay minerals are used as low-cost solid acid catalysts for numerous organic reactions. Previous studies have revealed that several types of acid sites exist on the substrate with different strength. For the most part, the acid sites are located the interlayer. The acidity is even more pronounced with the decrease of relative humidity. Studies about clay mineral structure have shown that different hydration states might coexist at given relative humidity and could potentially relate to the differences of reactivity of different layers. Relating clay mineral structure with their reactivity could improve the understanding of the contribution of each type of site to clay mineral acidity. This in turn could help in conception of highly efficient catalysts or guiding the choice for the selection of natural clay samples.

Objectives and scientific detailed program

The aim of the project is to attempt to relate the complex clay mineral structure to the experimental observations of different type of acid sites. The project will be organized in four parts:

- synthesis of clay minerals with defined chemistry;
- characterization of synthesis products by XRD, FTIR and NMR;
- assessment of acidity by the adsorption of liquid molecule probes by calorimetry and measurements of the interaction energies involved;
- study of structure of “clay – probe molecule” compound.

Candidate

MSc student with a scientific knowledge and expertise in chemistry and physics of materials.

Required skills:

- Curiosity, critical thinking, organizational and analytical skills, taste for laboratory experimentation;
- Experience and / or interest in the synthesis of solid materials;
- General knowledge in analytical chemistry;
- Fluent in English.

Supervisors and host laboratory

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Duration and gratification

6 months (starting on February 2019)

According to currently defined amount

Application deadline 23 October, 2018