

Synthesis and characterization of layered silicates for the study of their acid properties

Context

Clay minerals are used as low-cost solid acid catalysts for numerous organic reactions yet the exact nature of these acid sites is not well proven. Synthetic saponite with defined chemical composition and well-characterized crystal structure can be used as a model to elucidate different reactive surface sites and their strength. An experimental setup has been developed allowing the characterization of clay mineral surface acidity. The project will address the characterization of the change of saponite structure upon acid and heat treatment, and the consequences of different treatments for the material surface properties. 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

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 followed by acid or heat treatment;
- characterization of material by XRD, FTIR, NMR and gas adsorption;
- assessment of acidity by the desorption of liquid molecule probe by thermogravimetric analysis and measurements of the interaction energies involved.

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 and characterization 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 2021)

According to currently defined amount (~570 EUR/month)

Application (CV and cover letter) deadline 2 November, 2020