

Institut de Chimie de Clermont-Ferrand

ICCF - UMR 6296



Title of the master project : Rational design of hierarchically structured nanocomposites based on Layered Double Hydroxides

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Summary :

Materials with hierarchical porosity ranging from nano to macro-scale combine both a facile molecular transport through large « channels » provided by macropores and high internal reactive surface area provided by narrow nanopores. The emergence of such hierarchically structured materials directed recent efforts on the development of innovative processes to tailor the porosity which is highly decisive for advanced applications based on enhanced adsorption or exchange properties in areas such as decontamination, biocatalysis and energy storage.

The main aim of this project is to design and develop nanocomposites materials with hierarchical porosity in using pickering high internal phase emulsions (HIPE) stabilized by LDH colloidal particles. In all cases, physico-chemical properties of all components in the medium should be well-known. Porous nanocomposites based on polymers and layered double hydroxides (LDH) will be considered. A fine tuning of the synthetic process and parameters should provide the desired characteristics in the materials in terms of size, morphology and connectivity of pores. Elaborated materials will be deeply characterized by X-ray diffraction, spectroscopies (FTIR and Raman) and thermogravimetric analysis. To get better insight on the morphology modification scanning electron microscopy (SEM), transmission electron microscopy (TEM) and N₂ adsorption will be also carried out. Material performances will be mainly investigated for enzyme immobilization of interest in biocatalysis.

The candidate will have scientific skills in materials science and/or soft chemistry process. During this project he/her will develop knowledge and experience in different fields such as soft chemistry process, nanostructuration, structural characterization techniques in materials science and morphology characterization in using different techniques.

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