

Master 2 internship – Catalyst supports with hierarchical porosity prepared using a green method

Laboratory: Unité de Catalyse et de Chimie du Solide – UCCS UMR 8181

Team: Matériaux pour la Catalyse

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Duration and remuneration: about 580 euros/month for 5 months, from February 2020

Keywords: porous support; eco-conception; unidirectional freezing; cellulose

This Master 2 internship aims at preparing silica-based bimodal porous supports using a method derived from ice replication – also called ice-templating. This method allows to generate an oriented macroporosity within the monolithic material. Several advantages can be underlined, including the direct shaping of a solution of colloids into a centimetric object, and the use of a green porogen – water – for the production of large pores (2-50 microns). Moreover, the direction of the macroporosity can be oriented depending on the temperature gradient applied. A second pore network at the mesoscopic scale (~ 8 nm) can be obtained by adding sacrificial compounds, which are also used as binders before the thermal consolidation treatment. Multiporous monoliths have been previously prepared by ice-templating, however by using surfactants from the petrochemistry such as Pluronic P123.¹

During this internship, compounds derived from cellulose will be used as mesoporegens. Therefore, catalyst supports presenting a hierarchical porosity will be obtained while using a green method. Emphasis will be given on controlling the ordering of the mesoporosity along with its connectivity with the macropores. These supports are particularly attractive for the biomass conversion in liquid phase, where mass transfer is limiting. Therefore, the solids will be functionalized during a second part using transition metals (CuFe and CuCo) for selective hydrogenation of furfural.²

For applying, please send a CV and cover letter to

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¹ J. Dhainaut, G. Piana, S. Deville, C. Guizard, M. Klotz, Chem. Commun. 50 (2014) 12572.

² M. Audemar, C. Ciotonea, K. de Oliveira Vigier, S. Royer, A. Ungureanu, B. Dragoi, E. Dumitriu, J. François, ChemSusChem 8 (2015) 1885.