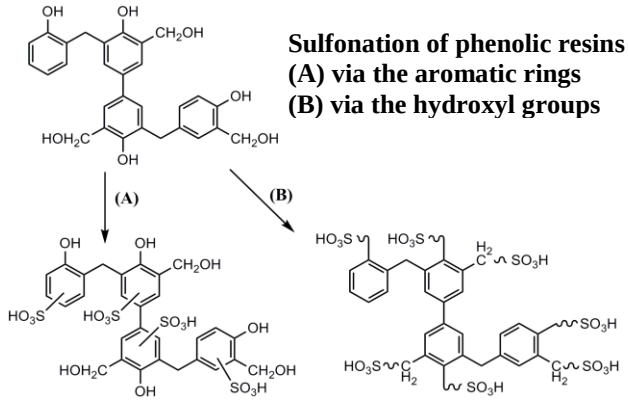
Mesoporous Phenolic Resins as Acid Catalyst for Esterification Reactions

Ilke Muylaert,[a] Els De Canck, [a] Jeremy Spileers,[b] An Verberckmoes, [b] Pascal Van der Voort [a]

[a]Ghent University, Department of Inorganic and Physical Chemistry, Center for Ordered Materials, Organometallics & Catalysis (COMOC), Krijgslaan 281-S3, 9000 Gent – Belgium; [b]Faculty of Applied Engineering Sciences, University College Ghent, Schoonmeersstraat 52, 9000 Ghent, Belgium

In recent years, the development of ordered mesoporous polymers – a new class of mesoporous materials – has attracted increasingly attention since these materials combine the large surface areas and porosity of mesoporous materials with the characteristics of organic polymers. In the field of catalysis, these materials are nowadays explored as straightforward heterogeneous support for different types of catalytic reactions. [1,2] An important advantage of phenol/formaldehyde resins is the very high mechanical and hydrothermal stability, especially in comparison with the relative unstable silica based mesoporous materials. [3]

In this study, highly ordered mesoporous phenolic resins are discussed as acid catalyst in the esterification of propanol with acetic acid. The mesoporous resins exhibit large surface areas of more than 500 m^2/g, large pore volumes (0,5 cm^3/g) and narrow pore size distributions (6 nm).



The polymers are sulfonated using two different sulfonation routes: (a) by direct sulfonation of the aromatic rings or (b) by grafting sulfonic acid precursors on the hydroxyl groups. By optimization the reaction conditions (different types of sulfonic acid precursors, reaction temperature and time, etc.), catalysts with acidities ranging from 0.2 to 2 mmol/g are synthesized.

These acid solid catalysts are investigated for their catalytic activity in the esterification of propanol with acetic acid. The differences in catalytic performance is thoroughly discussed. Finally, regeneration properties and stability in successive catalytic runs are evaluated.

[1] Meng Y., Gu D., Zang F., Shi Y., Yang H., Li Z., Yu C., Tu B., Zhao D., *Angew. Chem. Int. Ed.* **2005**, 44, 7053-7059.

[2] Xing R., Liu N., Liu Y., Wu H., Jiang Y., Chen L., He M., Wu P., Adv. Funct. Mater., **2007**, 17, 2455-2461

[3] Muylaert I., Borgers M., Bruneel E., Schaubroeck J., Verpoort F., Van Der Voort P., *Chem. Comm.* **2008**, 37, 4475-4477.

E-mail: Ilke.Muylaert@UGent.be www: http://www.we06.ugent.be/comoc