Catalysts development for the production of liquid fuels by bio-oil upgrading

Hydrodeoxygenation of model molecules

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Abstract

The hydrodeoxygenation (HDO) process may play an important role in the upgrading of biomass pyrolysis oil (bio-oil) to transportation fuels. In this process, oxygen is removed as water by addition of hydrogen. To minimize the high operating costs typically associated with bio-oil upgrading the development of catalysts with high activity, stability, and selectivity to the hydrocarbon products is an important task. It is particularly desirable finding catalysts and processes able to operate at low pressures and with minimum hydrogen consumption.

Supported noble metals (Pd, Pd, and Ru) catalysts have been widely investigated for the HDO reaction. These catalysts are very efficient in activating molecular H_2 and can catalyze hydrogenation steps that can lead to the formation of deoxygenated products and H_2O. During reaction, the oxygenated compound can adsorb and react either on the metal or on the support. Depending on the support, the surface configurations of the oxygenated molecules can greatly vary and thus can affect the product selectivity.

In order to design new catalysts with enhanced activity, selectivity, and stability, it is very important to understand the contributions of each type of sites on the surface to the reaction mechanism. Therefore, the conversion of m-cresol and phenol in the presence of H_2 has been investigated on different catalysts at 300◦C and atmospheric pressure. A novel reaction pathway that includes some important conceptual differences from those previously proposed in the literature is proposed.

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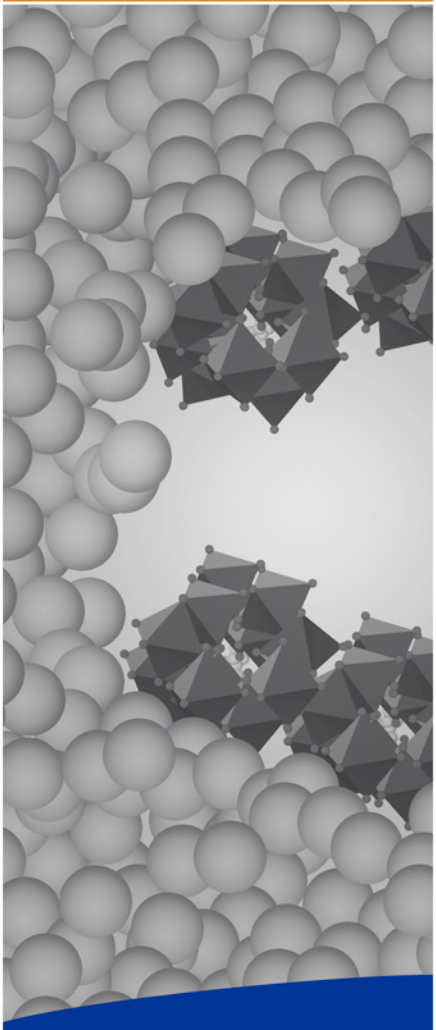

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