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COPPER NANOPARTICLES SUPPORTED ON POLYETHER-FUNCTIONALIZED MESOPOROUS SILICA. SYNTHESIS AND APPLICATION AS HYDROGENATION CATALYSTS

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Abstract

Copper nanoparticles were successfully synthesized on polyether-functionalized mesoporous silica to investigate the effect of metal loading (10, 25 and 35 wt. % Cu) on their structural and catalytic properties. The oxide forms of these nanocomposite materials were thoroughly characterized by nitrogen physisorption, SAXS, WAXS, TEM, EDXS, and TPR, whereas the metallic forms were analysed by N_2O chemisorption. The results indicated that the mesostructured SBA-15-like hybrids favoured the generation of highly dispersed supported copper nanoparticles with average sizes in the range of ~2-6 nm, displaying excellent activity in the hydrogenation of cinnamaldehyde. The average particle size was shown to increase with the metal loading. Among the tested catalysts, the highest activity was obtained for the sample having 25 wt. % Cu (total conversion of cinnamaldehyde in 150 min of reaction). All the catalysts exhibited high selectivity towards hydrocinnamaldehyde (> 85 mol %), which did not appear dependent on the copper particle size.

Key words: Cu-based catalysts, hydrogenation of cinnamaldehyde, polyether-functionalized mesoporous materials

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