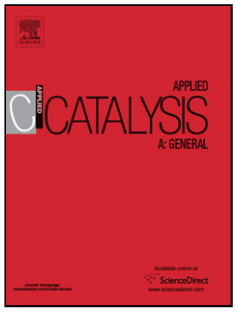

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Hydrogenating activity of Pt/zeolite catalysts focusing acid support and metal dispersion influence

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Abstract

Toluene hydrogenation was studied over catalysts based on Pt supported on large pore zeolites (HUSY and HBEA) with different metal/acid ratios. Acidity of zeolites was assessed by pyridine adsorption followed by FTIR showing only small changes before and after Pt introduction. Metal dispersion was determined by H_2-O_2 titration and verified by a linear correlation with the intensity of Pt^0-CO band obtained by *in situ* FTIR. It was also observed that the electronic properties of Pt^0 clusters were similar for the different catalysts. Catalytic tests showed rapid catalyst deactivation with an activity loss of 80-95% after 60 min. of reaction. The turnover frequency of fresh catalysts depended both on metal dispersion and the support. For the same support, it changed by a 1.7-fold (HBEA) and 4.0-fold (HUSY) showing that toluene hydrogenation is structure-sensitive, i.e. hydrogenating activity is not a unique function of accessible metal. This was proposed to be due to the contribution to the overall activity of the hydrogenation of adsorbed toluene on acid sites via hydrogen spillover. Taking into account the role of zeolite acidity, the catalysts series were compared by the activity per total adsorbing sites which was observed to increase steadily with $n_{Pt}/(n_{Pt}+n_A)$. An increase of the accessible Pt atoms leads to an increase on the amount of spilled over