Alkane Reactions over Nanoporous Catalysts

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Hydroisomerisation of straight chain hydrocarbons to branched alkanes exists as a method for increasing octane number of gasoline. The purpose of this work is to investigate the activity and selectivity of a var of metal nanoparticles encapsulated within the pores of SBA-15 and zeolite Y. Further investigation done into the metal particle size and dispersion on the catalysts, and the effect this may have on the acti and selectivity results.

Three SBA-15 catalysts (Pt-SBA, Ni-SBA and Pt/Ni-SBA) were prepared by incipient wetness and teste the hydroisomerisation/hydrocracking of n-heptane. Experiments were conducted in a micro-reacto atmospheric pressure over the temperature range 250-400 °C. The selectivity to hydroisomerisation prod was highest on Pt-SBA reaching a maximum of 23.1 wt% at 400 °C compared to the other two te catalysts, which was negligible. The selectivity to cracked products was highest on the Ni-SBA and Pt/ SBA catalysts, reaching 100 wt% at temperatures of 350 °C and 400 °C respectively, where Pt-SBA c reached 19.1 wt%. A direct linear relationship was found to exist between the total conversion selectivity to cracked products for Ni-SBA and Pt/Ni-SBA. Ni-SBA yielded the most coke deposition 0.191 wt% compared to Pt/Ni-SBA and Pt-SBA, which were found to have 0.119 wt% and 0.116 w From TEM analysis it is clear that on the bi-metallic Pt/Ni-SBA catalyst, the metal particles are 13.6 smaller, with a diameter of 13.42±4.17 nm, and more dispersed than on either of the mono-meta catalysts, therefore allowing for a greater surface area for reaction. The catalytic activity and selectivity n-heptane over Y zeolite catalysts are currently being tested and will be compared to those of SBA-15.