COKE FORMATION DURING HYDROISOMERIZATION AND HYDROCRACKING OF NORMAL PARAFFINS ON PHYSICALLY MIXED CATALYSTS CONTAINING HYDROGEN-MORDENITE

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Coke formation on physically mixed catalysts containing hydrogen-mordenite and 0.6 wt.% platinum-alumina is found to be directly related to the hydrocracking activity of the catalyst for n-hexane, n-octane and n-decane. No clear relationship is found between coke formation and hydroisomerization activity.

Physically mixed catalysts containing hydrogen-mordenite and 0.6 wt.% platinum-alumina have been found to be very active for hydroisomerization and hydrocracking of normal paraffins /1/. We now report on the relationship between the yields in hydroisomerized and hydrocracked products and the amount of coke deposited on these catalysts when using n-hexane, n-octane and n-decane as reactants.

The experiments were conducted in a fixed-bed reactor operated under differential conversions. The standard run conditions were: temperature 350 °C.

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Fig. 1. Deactivation of a 50 wt. % platinum-alumina plus hydrogen-mordenite catalyst in the case of n-hexane. 50 wt. % Platinum-alumina; 50 wt. % H-mordenite 350 °C; 1 atm.; H<sub>2</sub>: hydrocarbon = 9

pressure 1 atm; H<sub>2</sub> to hydrocarbon ratio 9.0; reaction time ∼ 6 hrs. The components of the catalysts were Zeolon 900H from Norton and 0.6 wt. % Pt-impregnated α-alumina (SCS 9 from Rhône-Progill; BET surface area, 23 m<sup>2</sup> g<sup>-1</sup>). The physically mixed catalysts were obtained by shaking together precalcined H-mordenite (one night at 380 °C and another at 550 °C under air) and prereduced platinum-alumina (12 hrs at 500 °C under hydrogen), both having a particle diameter of 0.080 to 0.120 mm.

The effect of reaction time on n-hexane conversion is shown in Fig. 1 for a catalyst mixture containing 50 wt. % of each platinum-alumina and hydrogen-mordenite. The conversions in hydroisomerization and hydrocracking decrease sharply in the first two hours of reaction and then more slowly. It can be seen that the aging effect is not the same for isomerization and cracking, the latter being more affected; the consequence is that as deactivation continues, the hydroisomerization to hydrocracking product ratio increases. The same phenomenon is observed with all the catalysts and for all three hydrocarbons.