

BOOK OF ABSTRACTS

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IMPROVING TOTAL ISOMERIZATION PROCESSES (TIP) BY SEPARATING BRANCHED HEXANE ISOMERS

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The refining industry makes every endeavour to enhance the octane quality of the gasoline (RON) satisfying at the same time the environmental standards imposed. The recently restrictions to the use of oxygenated additives has complicated even more this hard task. The Total Isomerization Process (TIP) is commonly used to increase the RON by separating linear molecules from light naphtha, and isomerizing them on a catalytic reactor. The actual TIP produces an isomerate with about 90 RON; however the data from UOP reveal that 30% of its typical composition consists of low RON monobranched hexane isomers. The goal of this work is optimizing the actual TIP coupling an adsorber able to remove the monobranched hexane isomers from the isomerate, and recycle them to the isomerization reactor. This extra unit will permit us to obtain a final isomerate reaching about 96 RON.

To achieve the objectives we have performed a set of breakthrough curves for single, binary, ternary and quaternary mixtures of hexane isomers *n*-hexane (nHEX), 3-methylpentane (3MP), 2,3-dimethylbutane (23DMB) and 2,2-dimethylbutane (22DMB) in pellets of zeolite BETA (Fig. 1), covering the temperature range 423-523 K and partial pressures up to 30 kPa. The Figures 2(a-b) shows typical multicomponent equimolar experiments. From these data, single and multicomponent adsorption equilibrium isotherms were collected. A Tri-Site Langmuir model (TSL) was developed to interpret the equilibrium data based on the assumption that the zeolite contains three different sites: straight and zig-zag channels and the intersection between them. The dynamic adsorption model describe with a good accuracy the behaviour of the multicomponent experiments using TSL predictions (see Fig. 2). For all experiments, the sorption hierarchy in the zeolite BETA is: nHEX>>>3MP>23DMB>>22DMB. Zeolite BETA demonstrates a significant selectivity between hexane isomers, especially at low coverage, giving a good perspective regarding their separation by adsorption processes.

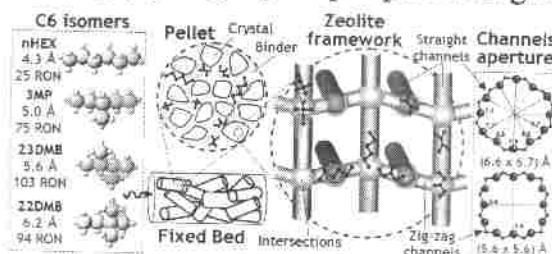


Figure 1. 3D-view of the hexane isomers and kinetic diameters. It is also shown a perspective view of zeolite BETA framework and pore apertures.

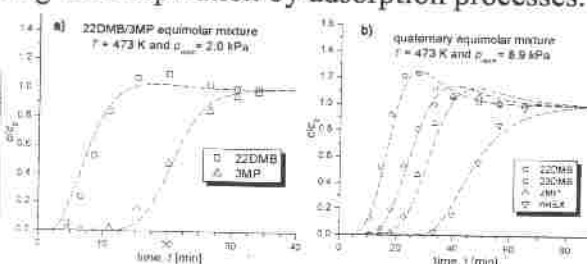


Figure 2. Breakthrough curves for equimolar mixtures.