Aromatics Production By Paraffin Dehydrocyclization: Mechanism And The Kinetics Of n-C8 Dehydrocyclization Reaction On Acidic Pt/Al2O3 Catalyst

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ABSTRACT

The kinetics of n-octane dehydrocyclization reaction has been studied using 0.3% acidic platinum-alumina catalyst in a micro catalytic reactor in a temperature range of 573K - 693K with hydrogen as the carrier gas at 1.8 atmospheric pressure. A Langmuir-Hishenwood-Hougen-Watson type of rate model was developed for the proposed mechanism involving the aromatization of adsorbed species on the catalyst sites**.** Sixteen rate equations were derived and the rate equations that gave the best fit of the experimental data were selected. Consequently, the rate and the thermodynamic constants were evaluated from the model equations developed using a search technique employing the Nelder and Mead modified simplex optimization routine. By using the least squares regression analysis, the activation energies and the heat of adsorption values were evaluated to be 25.465 kcal/gmol and –9.9203 kcal/gmol respectively. The frequency factor was also estimated as 4.896 x 108 gmol/ (g-catalyst) (h). Results obtained compared excellently with that of Onukwuli (1988) who obtained a value of 1.516 x 108 mol/ (g-catalyst) (h) for the frequency factor and values ranging between 18 – 38 kcal/gmol for the activation energy of normal octane conversion in the temperature range 673 – 733K at a total pressure of 1 atm, using various reactants and H2 diluents partial pressures. These results are in excellent agreement with the known and expected trends.