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MTBE synthesis on BEA type zeolites

Begum Tokay[1] and **Ayşe Erdem-Şenatalar**[2]
[1]University of Nottingham, UK
[2]Istanbul Technical University, Turkey

The ion exchange resins used as catalysts in the production of octane boosting ethers e.g. MTBE and ETBE are thermally unstable at temperatures above 100oC, decompose to corrosive products that cause environmental problems. Zeolites are known to be potential alternative catalysts for the synthesis of ethers since they offer the advantages of high thermal stabilities and selectivities. Although MTBE usage has banned over 20 states in the US and limited in EU countries, its demand has increased in the past few years driven by cleaner fuel requirements in China and increased gasoline consumption in Asia, Americas, and the Middle East. Zeolite Beta is a BEA type zeolite and gives a much higher activity for the same reaction when compared to other zeolites. The importance of zeolite Beta has increased recently since BASF synthesized organic template free version. The purpose of this study was to gain more insight about the factors affecting the MTBE synthesis activities of zeolite Beta. A commercial sample was used as catalysts in the reaction at different temperatures. The catalyst was characterized by chemical analyses. Nitrogen adsorption was carried out to obtain surface area. Kinetic experiments were conducted to determine the dependence of the reaction rates on the concentrations of the reactants. Kinetic data was treated with the LHHW approach for possible reaction mechanisms. The results show that the MTBE synthesis activities of the Beta catalyst are higher than other zeolites in literature. Synthesis is discussed with the kinetic data and possible reaction mechanisms.

Begum.Tokay@nottingham.ac.uk

The evolution of energy - The role of engineers and scientists

Davis L Ford
University of Texas at Austin, USA

The years of 2000 to 2016 have seen an evolutionary transition in the world marketplace for energy---conventional, enhanced and non-fossil fuel alternatives. The extraction of "tight natural gas and oil" and alternatives create an evolving science and engineering expertise, particularly in the fields of biochemistry, organic and physical chemistry, physics, petroleum, environmental, and chemical engineering. All of the disciplines and their applications will affect the gross domestic product (GDP) of both exporting and importing countries. This presentation includes but is not limited to water use, reuse and conservation, treatment of residuals compliant with state and federal statutes and regulations and sound engineering with respect to environmental compliance, capital and operating cost effectiveness, as well as financial optimization and sound economics. This presentation will include the technical approaches which are required to give each case history cited, the basis on the decision-making process, engineering and science, case histories and financial ramifications.

dfordphd@aol.com