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Adsorption Capacity of Various Hydrocarbons through Zeolite Structures as Determined by Breakthrough Experiments

The goal of this project is to develop adsorption isotherms for various hydrocarbons in zeolite structures. While zeolite structures have been known to be flexible, this research will focus on the effects of different molecules being adsorbed, and whether the expansion and contraction of the zeolite unit cell has an effect on adsorption capacity. The ability to manipulate the framework flexibility of a zeolite structure could lead to huge advances in catalysis and separation processes utilizing zeolite structures, particularly in the petrochemical industry. With possibly large advances in specific processes including, but not limited to: isomerization, hydrocracking, dewaxing, detergent building, and otherwise difficult gas separations. This research will focus primarily on the adsorption capacity of ZSM-5 zeolite with respect to n-hexane and 2-methylpentane hydrocarbons in pure and binary flow systems, in an effort to observe a potential framework flexibility in the zeolite structure. ZSM-5, n-hexane, and 2-methylpentane have been chosen due to the prevalence of relevant literature data. Experiments are still being conducted, however preliminary data has proven highly variable and inconclusive. Current and future efforts are to be directed at lowering the data variability, and improving the overall consistency of the results.