

Methane Chlorination with Chlorine Molecules using Zeolite Catalysts: Effects of Si/Al Ratios and Framework Types

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Methane (CH_4) chlorination with chlorine molecule (Cl_2) can produce various chlorinated products via C-H bond activation in CH_4 . This reaction can occur spontaneously with irradiation of UV light even in the absence of a catalyst, which follows a free radical-mediated chain reaction mechanism. Therefore, the various products can be formed with a statistical thermodynamic distribution. In this work, CH_4 chlorination is controlled by using HY and MFI zeolites with various Si/Al ratios under various reaction conditions in order to break the thermodynamic product distribution and thereby produce a desired mono-chlorinated product (i.e., CH_3Cl). The results demonstrated that the framework type of zeolite and its Si/Al ratio could control the CH_4 conversion, CH_3Cl selectivity, and hence CH_3Cl yield under various reaction conditions. In particular, systematic correlations between the catalyst properties and CH_3Cl yield were constructed. All the zeolite catalysts suffered from framework dealumination by HCl produced during the reaction. The details of CH_4 chlorination and the results are going to be addressed in this poster.