ION EXCHANGE OF Na^+ IONS WITH H^+ IONS ON ZSM-5 ZEOLITE USING ACETIC ACID

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Abstract

Based on previous research into the acid-base and ion-exchange properties of ZSM-5 zeolite, there is a need to explore the possibility of ion exchange on high-silica ZSM-5 zeolite with commercially available chemicals, while simultaneously monitoring changes in the structural and morphological characteristics of the zeolite, as well as the stability of its crystal structure. Since ZSM-5 zeolites are primarily used in catalytic processes in the petrochemical industry, particularly in acid-catalyzed hydrocracking reactions, it is very important to ensure an adequate number of acidic sites for more efficient catalytic activity. Therefore, this study investigated the possibility of exchanging sodium ions with hydrogen ions on ZSM-5 zeolite with a molar ratio of (SiO_2/Al_2O_3 = 1000) using an ion-exchange process with acetic acid. By employing various instrumental methods (XRD, FT-IR), along with chemical analysis of ZSM-5 zeolite samples, the influence of hydrogen ion concentration on the chemical composition and structural characteristics of ZSM-5 zeolite was monitored at different acid concentrations and exchange times. It was shown that ion exchange with acetic acid leads to a significant reduction in sodium content even with less concentrated solutions, while maintaining the stability of the crystal structure of ZSM-5 (SiO_2/Al_2O_3 = 1000) and a high degree of crystallinity. The degree of ion exchange with acetic acid is very high (around 90%) even after just one hour of ion exchange.

Keywords: *ion exchange, acetic acid, ZSM-5, zeolite.*