

Characterisation of the H-ZSM-5 Zeolite Samples Synthesized in Wide Range of Si/Al Ratios and with H₂SO₄ and CH₃COOH Acids Used for Transformation to H-Form

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Abstract : One of the key characteristics of zeolites with ZSM-5 crystalline form is the possibility of synthesis in a wide range of molar ratios, from the relatively low ratio of about 20 to highly silicate forms with a Si/Al ratio over 1000. For industrial production and commercial use of this type of zeolite, it is very important to know the influence of the molar Si/Al ratio on the characteristics of zeolite powders. In this paper, the influence of the Si/Al ratio on the characteristics of H-ZSM-5 zeolites synthesized in the presence of tetrapropylammonium bromide is questioned, including the possibility of conversion to the H-form using different acids. The quality of the samples is characterized in terms of crystallinity, chemical composition, morphology, granulometry, specific surface area (BET), pore size and acidity. XRD, FT-IR, EDX, ICP, SEM and TPD instrumental techniques were used to characterize the samples. In most of the performed syntheses, zeolite has been obtained with very good properties. It was shown that the examined conditions have a significant influence on the characteristics of the synthesized powders. The different chemical composition of the starting mixture, ie. the Si/Al ratio, has a very significant influence on the crystal structure of the synthesized powders, and thus on the other tested characteristics. It has been observed that optimal ion exchange results for powders of different Si/Al ratios are achieved by using different acids. Also, the dependence of the specific surface on the concentration of H⁺ or Na⁺ ions was confirmed.

Keywords : Characterisation, H-ZSM-5, molar ratio, synthesis, tetrapropylammonium bromide

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