

## Effect of the Nature of Silica Precursor in Zeolite ZSM-22 Synthesis

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**Abstract :** The zeolite ZSM-22 material demonstrated effective hydrophilic character as a nanoadditive filler in the preparation of nanocomposite membranes. In this study, nanorods ZSM-22 zeolite materials were hydrothermally synthesised from a homogenous gel mixture prepared using different silica precursors: colloidal silica, fumed silica, tetraethylorthosilicate (TEOS), and aluminium precursor: aluminium sulphate octadecahydrate ( $\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O}$ ) to Si/Al of 60. This was focused on developing a defect-free zeolite framework for effective use in applications such as membrane separation process, adsorption, and catalysis. The obtained ZSM-22 zeolite materials with 60 Si/Al ratio exhibits high crystallinity, hydrophilicity, and needle-like morphologies, suggesting successful synthesis as shown by X-ray Diffraction (XRD), Brunauer-Emmett-Teller (BET), Fourier-Transform Infrared Spectroscopy (FTIR), Transmission Electron Microscopy (TEM) and Scanning Electron Microscopy (SEM) physicochemical analysis. It was revealed that the use of different nature of silica precursors significantly influenced the properties of the final product and contributed to the development of defect-free zeolite material. As such, the crystalline nanorods of Theta-1 (TON) ZSM-22 obtained from TEOS silica showed high phase purity, defect-free, and narrow particle size distribution. Morphological analysis exhibited that the use of TEOS as silica precursor was effective than its counterparts and produced high crystalline needle-like agglomerated particles.

**Keywords :** silica precursor, hydrothermal synthesis, zeolite material, ZSM-22

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