

Synthesis and Characterization of Nano Zeolite-A (LTA Zeolites) With Aid of Sodium Dodecyl Sulfate (SDS) as Particle SizeControlling Agent

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The conventional synthetic zeolites historically known as molecular sieves are crystalline aluminosilicates with well-defined pores. Nano zeolite-A synthesis has received considerable attention in the past decade and has today turned into essential in commercial materials. Usually, LTA zeolites (Linde Type A) are synthesized via low-temperature hydrothermal crystallization in the presence of the structure directing agents, known as “organic templates”. Generally, Tetramethylammonium-hydroxide will be used as a template. However, these templates are expensive and non-recyclable. Therefore, under the green chemistry point of view, numerous efforts have been devoted to synthesize template free LTA type nano zeolites. In this work, nano Zeolite-A was synthesized via both hydrothermal and microwave methods in the absence of organic templates. Instead of them, an anionic surfactant called Sodium dodecyl sulfate (SDS) was used for controlling the particle size. The effect of different crystallization conditions such as aging time, reaction time and temperature for changing properties such as particle size, morphology were investigated. The final products were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), energy-dispersive X-ray (EDX) and Fourier-transform infrared spectroscopy (FTIR) techniques. The obtained SEM and XDR results showed that both methods have produced pure LTA zeolites crystals with a 300 - 500 nm range in size with a high degree of crystallinity. In addition, the absence of characteristic zeolitic water peaks proved the synthesized compound was in dehydrated form. Compared to the hydrothermal method microwave approach is effective because it requires less reaction time and no any considerable change observed in crystal size and crystallinity. Therefore, surfactant based zeolite-A synthesis would be potentially important in the chemical industry due to its competitive advantages as a green approach and cost-effectiveness.

Keywords: Nano zeolite-A, Organic templates, Surfactants, Microwave method, Hydrothermal crystallization