Optimization of Nano Zeolite-A Production Process by Contrasting Experimental Condition in Microwave - Assisted Synthesis Method as an Economically Viable Preference

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Abstract

Synthetic zeolites are used commercially more often than natural zeolites due to the purity of crystalline products and the uniformity of particle sizes. With the properties of synthetic zeolite, that can employ wide a variety of applications in comparatively natural occurrence. The synthesis of nano zeolites has received much attention in the past decade because those can have different of properties than their microscale counterparts. As usual, the reduction of particle size from the micro level to the nanometre scale can change several chemical and physical properties. However, due to the high cost of production and non-recyclable organic templates, this study aims to optimize the production process of nano zeolite-A, synthetic zeolite with the anionic surfactant of sodium dodecyl sulfate as a site directing agent under contrasting laboratory conditions. For that, microwave-assisted synthesis was performed under different conditions such as different time intervals, aging conditions as well as different temperatures. In order to achieve nano zeolite-A and after the purification, samples were subjected to characterization for structural determination. The Furrier transform infrared spectroscopy (FTIR), Scanned electron microscopy (SEM), Energy-dispersive X-ray spectroscopy (EDX) and X-ray diffraction spectroscopy (XRD) were employed as a sample characterization. Results reveal that the process cycle one and two (Aging: 2 – 3 days at 40-50 °C, crystallization: 3 hours at 100 - 110 °C) was towards zeolite-A and third towards the formation of sodalite. While the cycle two conditions (Aging: 3 days at 40 °C and crystallization: 3 hours at 110 °C) was the most effective for nano zeolite-A production and XRD, SEM results of cycle two was emphasized the optimize production of nano Zeolite-A with 300-310nm size crystals. Furthermore, above results revealed that surfactant-based zeolite synthesis would be potentially important and viable option for nano zeolite-A synthesis.