

The Synthesis of Zeolite from Biomass Ash for Hydrogen Sulfide and Volatile Organic Compounds Removal

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Abstract

This research aims to study the optimum condition for zeolite synthesis from rice straw for removing hydrogen sulfide or volatile organic compounds (VOCs). The synthesis process is calcining the rice straw at 700°C for 3 hours; after that, digesting with an acid solution, drying and calcining at 700°C for 3 hours. The rice straw ash was fused with sodium hydroxide at 550°C for 1 hour and then stirred in 3 M of sodium hydroxide solution and aluminum hydroxide solution for 30 minutes. The zeolite was crystallized by hydrothermal process at various temperatures (80, 105 and 120°C) and reaction times (3, 4 and 5 hours). The zeolite synthesis product was investigated by X-ray diffraction (XRD), scanning electron microscope (SEM), and X-Ray fluorescence spectrometer (XRF) techniques. The results found that the chemical compositions of rice straw ash are silica and alumina. Moreover, the crystalline characteristics of synthetic zeolite from rice straw ash are cubic particle size of 1.4 micrometer. In conclusion, the rice straw ash can be synthesized to 4A zeolite, which has an adsorption efficiency of hydrogen sulfide and volatile organic compounds in asphalt of 75.00% and 94.09%, respectively.

Keywords

Rice straw ash, Zeolite, Adsorption, Asphalt, Volatile organic compounds.