

Reuse of Municipal Solid Waste Incinerator Fly Ash for the Synthesis of Zeolite: Effects of Different Operation Conditions

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Abstract : This study tries to reuse the fly ash of municipal solid waste incinerator (MSWI) for the synthesis of zeolites. The fly ashes were treated with NaOH alkali fusion at different temperatures for 40 mins and then synthesized the zeolites with hydrothermal method at 105oC for different operation times. The effects of different operation conditions and the optimum synthesis parameters were explored. The specific surface area, surface morphology, species identification, adsorption capacity, and the reuse potentials of the synthesized zeolites were analyzed and evaluated. Experimental results showed that the optimum operation conditions for the synthesis of zeolite from the mixed fly ash were Si/Al=20, alkali/ash=1.5, alkali fusion reaction with NaOH at 800oC for 40 mins, hydrolysis with L/S=200 at 105oC for 24 hr, and hydrothermal synthesis at 105oC for 48 hr. The largest specific surface area of synthesized zeolite could be increased to 943.05m²/g. The influence of different operation parameters on the synthesis of zeolite from mixed fly ash followed the sequence of Si/Al > hydrolysis L/S > hydrothermal time > alkali fusion temperature > alkali/ash ratio. The XRD patterns of synthesized zeolites were identified to be similar with the ZSM-23 zeolite. The adsorption capacities of synthesized zeolite for pollutants were increased as rising the specific surface area of synthesized zeolite. In summary, MSWI fly ash can be treated and reused to synthesize the zeolite with high specific surface area by the alkali fusion and hydrothermal method. The zeolite can be reuse for the adsorption of various pollutants. They have great potential for development.

Keywords : alkali fusion, hydrothermal, fly ash, zeolite

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