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Obtaining of selective porous materials from recycling of industrial waste coal fly ash for applications in environmental protection

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The fast increase in population and the economic growth have determined an increase in energy demand. The coal reserves are distributed worldwide, and coal is known to be the most stable and available energy source. However, utilization of coal as an energy source involves the generation of a huge amount of coal ash, and the recycling rate of this is rather low. In this paper, an environmentally friendly method for coal ash recycling is described. This refers to zeolite obtaining from industrial waste coal ash (CFA) by two stages of fusion and hydrothermal synthesis methods, with or without acid washing pretreatment using different conditions. The synthesized zeolites were then tested for CO₂ adsorption from flue gas. From experimental results, it was found that the impurities (i.e., Mg, Ca, Fe, Ti, K oxides) in CFA are efficiently removed by acid washing pretreatment. From three different acids used (i.e. H₂SO₄, HNO₃ and HCl), HCl shown the highest pretreatment performance, while the most suitable pretreatment conditions to enhance high purity raw material, up to 80-90% purity, were by using 25%HCl the acid to CFA ratio of 20 ml HCl/gCFA at 75°C for 4 h. After fusion at 550°C with NaOH/CFA mass ratio of 2 and further crystallization at 85°C for 4 h, the pretreated CFA was transformed to zeolite. Regarding CO₂ adsorption testing, prepared zeolite provided high CO₂ adsorption capacity when the gas composition was 15% CO₂, in nitrogen, simulating CO₂ concentration in flue gas, and zeolite adsorption performance is comparable with the used commercial sorbents.

Biography

E David is a Graduate of Faculty of Chemistry and Chemical Engineering, MS-in Physics-Chemistry of Surface and Analytic Chemistry of "Babes-Bolyai" University from Cluj-Napoca, Romania. He serves as a Doctor in Chemical Science, Associate Professor and Head of Laboratory: Carbonic Materials, Composites & Analysis Techniques, at National Research Institute of Cryogenics & Isotope Technologies-ICIT Rm.Valcea, Romania. His overall research topics approached concern to renewable energy sources; conservation of energy; energy from waste; methods and mechanisms for the reduction of pollution; methods of waste recycling and tests to determine their toxicity and; development of analysis techniques with applications in energy & environment fields.

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