

Synthesis of Na zeolites from fly ash in a pilot plant scale. Examples of potential environmental applications

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ABSTRACT

Zeolite synthesis could be one of the potential applications of fly ash to obtain high value industrial products for the environmental technology industry. Among many potential applications, these products may be used in the water decontamination technology since low-silica sodium and potassium zeolites obtained from fly ash have high ionic exchange capacities, specially for heavy metals and ammonium. The study focuses on the synthesis of sodium zeolites from one Spanish fly ash. The results include the laboratory scale synthesis experimentation which was first performed using grams in Parr digestion bombs. Secondly, experiments using a kilogram size were performed in an autoclave reactor (BACHILLER, 5 L autoclave) with stirring, temperature and pressure control. The synthesis conditions for a pilot-scale experiment were selected from the results obtained at lab-scale experimentation to synthesize NaP1 zeolite (2M NaOH for the activation solution, a fly ash/solution ratio of 1.1 kg/2.2 L, T=150°C and t=24h). The pilot plant scale experiment was performed in a 10 m³ R-410-A reactor made up of 304 steel, and the zeolitic product was filtered in a 2 m³ polypropylene press filter and a 16m³/h filtering pump. In this experiment 1100 kg of fly ash, 1848 kg of osmotized water and 352 kg of a 50% NaOH solution. The zeolitic product obtained was made up mainly of NaP1 zeolite and an minor proportions of analcime. This zeolite-rich material was tested for different applications in the water decontamination technology. Results of these test are reported in this work.