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EVALUATION OF MODIFIED FLY ASH BASED NAA-ZEOLITE: EFFECT OF CRYSTALLINITY ON CO_2 CAPACITY

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Abstract

NaA zeolite was successfully synthesised from fly ash through hydrothermal process. The synthesised NaA zeolite was modified with Li+, Ca_2+ and Mg2+ through ion exchange at a temperature of 60 °C and contact times of 1 h and 4 h. In this study the crystallinity of the synthesised NaA as well as its modified (LiA, CaA and MgA) was evaluated towards CO_2 adsorption capacity using temperature programmed desorption (TPD) process at low temperature (40- 150 °C) and high temperature (150-700 °C). The mineral phase and structural characteristics of zeolites were examined using XRD and FT-IR. The results from XRD and FT-IR spectra revealed unique structural alterations influenced by the intrinsic characteristic of individual cation incorporated in NaA zeolite. Monovalent cations displayed highest crystallinity compared to divalent cations (downward order: NaA > LiA > MgA > CaA). Low and high temperature CO_2-TPD profiles were independent of the degree of crystallinity of the zeolites and a significant amounts of CO_2 desorption occur at low temperature indicating that physisorption is the most prominent adsorption mode in NaA, LiA, CaA and MgA zeolite.

Key words: adsorption, carbon dioxide, crystallinity, ion exchange, synthesis, zeolite

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