Improvement in The Selectivity of CO_2/CH_4 adsorption on NaOH Modified Zeolite A-4

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ABSTRACT

Biogas is a renewable energy source that contains methane (CH_4) and carbon dioxide (CO_2). High CO_2 content reduces the heating value and quality of biogas, therefore a purification process is needed. This study aims to enchange for biogas purification using NaOH-modified Zeolite 4A. Zeolite was chosen because it has a porous structure and strong affinity toward CO_2 molecules. The research used an experimental method with NaOH activation concentrations of 0.5 M, 1 M, and 2 M. The adsorption process was carried out using different CO_2 concentrations (1506 ppm, 3193 ppm, 4879 ppm, and 8248 ppm) with a constant CH_4 concentration of 496 ppm. Gas adsorption was analyzed using Gas Chromatography (GC) after 4 hours of incubation at 25°C. The results showed that NaOH activation increased the adsorption capacity of CO_2 compared to untreated zeolite. The highest CO_2 adsorption was achieved by zeolite activated with 2 M NaOH at 8248 ppm CO_2 concentration. In contrast, CH_4 adsorption decreased after activation because the zeolite surface became more selective toward CO_2. The selectivity of CO_2/CH_4 adsorption also increased with higher CO_2 concentration and stronger NaOH activation.NaOH-modified Zeolite 4A showed good potential as an adsorbent for biogas purification by improving CO_2 adsorption and CO_2/CH_4 selectivity. However, the ANOVA test results showed that there were no significant differences due to factors A and B, as well as their interaction.

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***Key words**: Adsorption, Biogas, Carbon Dioxide, Metane, Selectivity.*