

CO₂ capture by modified kaolinite minerals

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After industrial revolution, the CO₂ emission to the atmosphere has gradually increased, therefore it is more important to reduce the CO₂ discharge. Kaolinite, a common clay mineral, is a dioctahedral 1:1 phyllosilicate formed by Si-O tetrahedral sheets and Al-O octahedral sheets. In this study, kaolinite minerals are used to capture CO₂ due to their layer structures and high adsorption efficiency. Moreover, the surface area and porosity of kaolinites are enhanced by acidic treatment. Kaolinites are also modified with MEA and EDA to promote the ability of CO₂ adsorption. The crystalline structures before and after acidic treatment and amine-modification would be analyzed by using X-ray diffractometer. The specific surface area and porosity would be examined by BET analyzer. The morphology would be observed by scanning electron microscope.

The results show that the best acid-treatment condition for kaolinite is with 3M H₂SO₄, reaction time of 10 hr, stirring rate of 100 r.p.m at 95 °C. The specific surface area increase from 18 m²/g of the original kaolinite to 83 m²/g of acid-treated kaolinite. And then the acid-treated kaolinite was modified by MEA and EDA. The CO₂ adsorption capacity was examined by thermo-gravimetric analyzer. It is observed that kaolinite with amine-modification has a better CO₂ adsorption capacity than that only with acid-treated kaolinite. The CO₂ adsorption mechanism via the property analysis before and after CO₂ adsorption will be discussed latter.

Keywords: Kaolinite, acid-treatment, amine-modification, CO₂ capture.