Efficiency evaluation of synthesized adsorbent using coal ash

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Research Background：

A greenhouse gas (GHG) is a gas that absorbs and emits radiant energy within the thermal infrared range, causing the greenhouse effect. The primary greenhouse gases in Earth's atmosphere are water vapor (H_2O), carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and ozone (O_3). Without greenhouse gases, the average temperature of Earth's surface would be about −18 °C, rather than the present average of 15 °C.

Global annual mean CO_2 concentration has increased by 50% since the start of the Industrial Revolution. The increase has been attributed to human activity, particularly deforestation and the burning of fossil fuels. This increase in CO_2 and other long-lived greenhouse gases in Earth's atmosphere has produced the current episode of global warming.

The ever increasing demand for electricity has resulted in the burning of large quantities of coal and resulted in large quantities of fly ash (FA) . Despite many environmental issues associated with coal combustion, coal-fired powerwill remain a major source of electrical power generation for the following years. It is necessary to investigate methods that can be used to produce or manufacture value-added products from fly ash. The most successful application of fly ash is in concrete or cement manufacturing.

Research Results：

In this study, coal ash was utilized as solid adsorbents for CO_2 capture via several synthesis routes. After synthesis, the samples were analyzed by X-ray fluorescence spectrometer, X-ray diffractometer, and scanning electron microscope to obtain compositions, crystal structures, and images. Coal ash is the solid waste produced by coal-fired power plants. Using coal ash as a material to synthesize adsorbents can reduce costs and achieve environmental benefits.

Fly ash is a kind of industrial waste, and a large amount of fly ash is produced by power plants throughout the world every year. It is a worldwide concern for the disposal of fly ash and the way convert them into useful products instead of burying them in landfills. The most successful application of fly ash is in concrete or cement manufacturing. Furthermore, using coal ash as a material to synthesize CO_2 absorbents can achieve the target of sustainable utilization.

Figure 1 Left: Autoclave reactor; Right: Microwave system

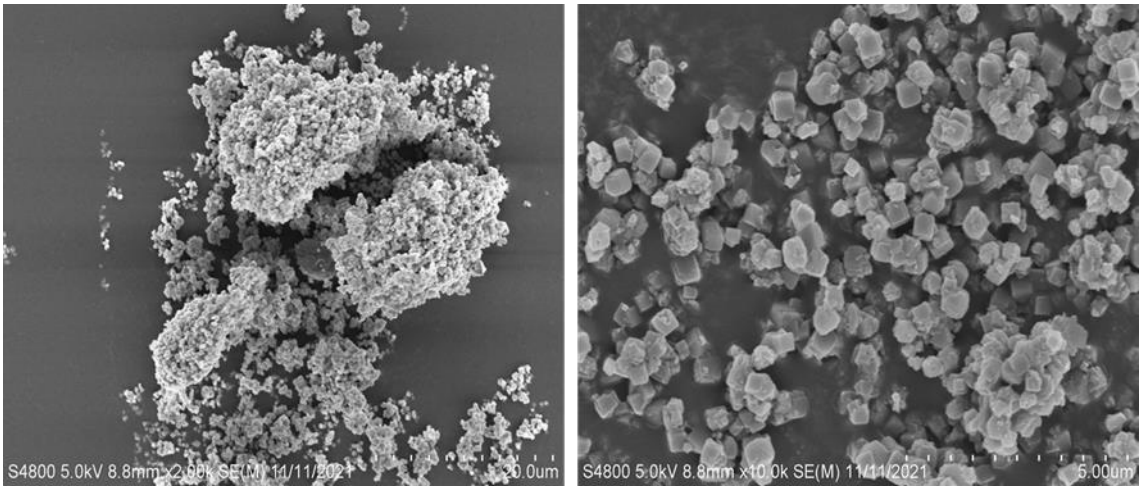

Figure 2 The SEM of microwave products.