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Experimental Study on Mineralization of Carbon Dioxide Sequestration with FGD Gypsum

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Control of the carbon dioxide in the atmosphere is considered the key measures to solve the greenhouse effect. Large-scale storage and fixed carbon dioxide is the main way to reduce emissions of carbon dioxide, including geological storage, ocean storage and mineral carbonation. The mineral carbonation reaction products are the long-term stability, which arise more and more attention. In this paper, Based on chemical thermodynamics and kinetics theory, flue gas desulfurization gypsum (FGD gypsum) as a reaction feedstock was used in the laboratory under controlled conditions to explore the feasibility of mineral carbonation to sequestrate carbon dioxide. The impact of carbonation environmental conditions was investigated to determine the appropriate feedstock, to increase the understanding of mineral carbonation process and seek the reaction condition for increasing conversion rate, study the micro-mineral carbonation reaction mechanism, trying to explore

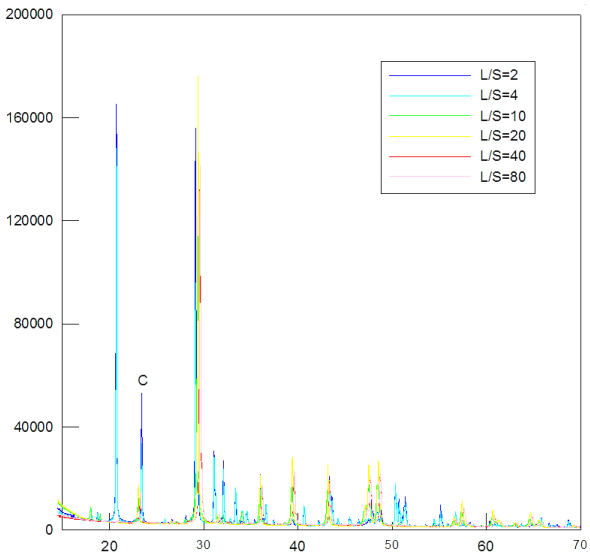

Fig.1. The XRD analysis of different S/L ratio

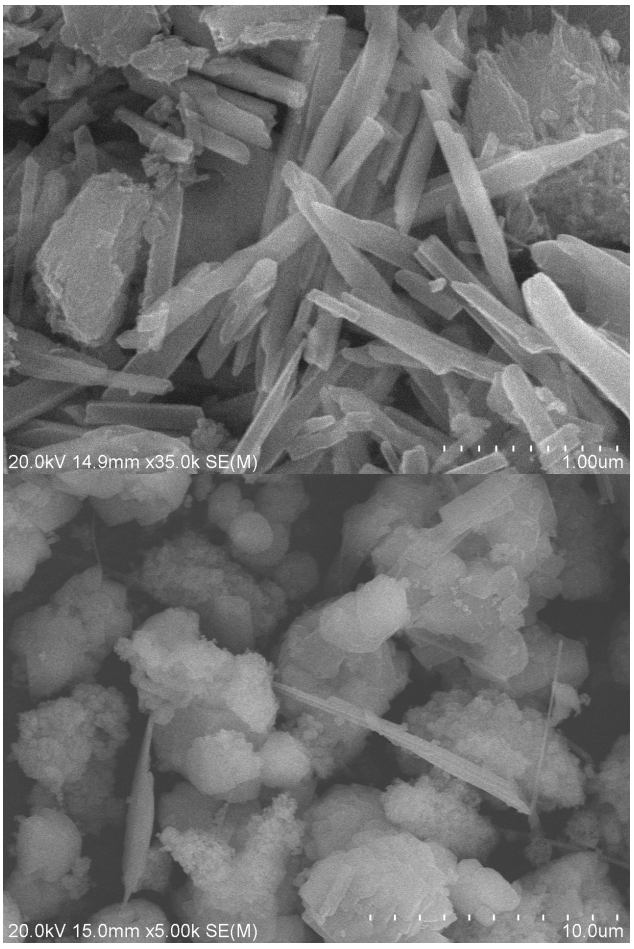

Fig.2. SEM photo of the precipitation after carbonation with L/S ratio 2 and 16

sustainable development and control of carbon dioxide gas emissions. FGD gypsum was carbonated in aqueous suspensions to study its reaction mechanisms. Process variables, such as L/S ratio and reaction time, were systematically varied, and their influence on the carbonation rate was investigated in the atmospheric pressure. FGD gypsum from the power company was

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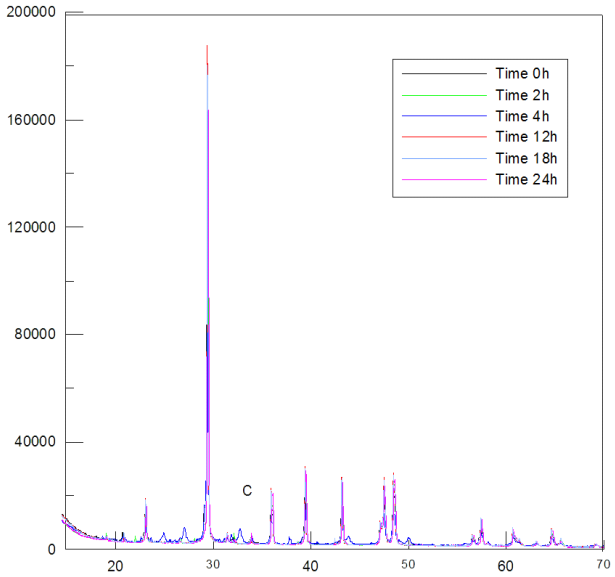

Fig.3. The XRD analysis of different time

investigated to determine the extents of carbonation and to elucidate those compositional factors controlling the reactions. Process variables, such as L/S ratio and reaction time, were varied to investigate their influence on the carbonation rate. The result showed that the optimal liquid-to-solid ratio in this type of reactor is 2 kg/kg. At the beginning of 12h, the carbonated calcium increased while after 12h, the relative intensity of Calcite from the XRD result seemed decline. This may be caused by the dissolution of CaCO3 due to the decrease of pH. The SEM micrographs of fresh and carbonated samples showed the change in morphology of particle surface. The carbonation of Ca takes place in two subsequent steps (i.e. dissolution and precipitation) rather than by solid-state conversion. The diffusion of Ca toward the surface of FGD gypsum particles probably determines the overall reaction.

Key words: desulfurization gypsum; carbonation; carbon dioxide; mineralization storage

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