Preliminary Results of carbonate mineralization by gaseous CO\textsubscript{2} with Ca\textsuperscript{2+} or Mg\textsuperscript{2+} electrolytes

Gwonyong Choi\textsuperscript{1}, Jaeseon Park\textsuperscript{1}, Seonyi Namgung\textsuperscript{1}, Jaeyoung Choi\textsuperscript{2}, Giehyeon Lee\textsuperscript{1,*}

\textsuperscript{1}Department of Earth System Sciences, Yonsei University, Republic of Korea

\textsuperscript{2}Korea Institute of Science and Technology, Republic of Korea

(*correspondence: ghlee@yonsei.ac.kr)

Carbonate mineralization is one of the possible ways to reduce the amount of CO\textsubscript{2} gas in the atmosphere, which is a representative greenhouse gas causing global warming. The advantage of this process is that carbonate mineral products can be used as industrial resources. However, the efficiency of carbonate mineralization for CO\textsubscript{2} gas reduction has not been fully investigated yet. This study examined to find the optimal conditions for carbonate mineralization using Ca\textsuperscript{2+} or Mg\textsuperscript{2+} electrolytes purged with CO\textsubscript{2} gas.

Batch experiments were conducted with 250 mL of 0.3 M Ca\textsuperscript{2+} or Mg\textsuperscript{2+} in the presence or the absence of the headspace (250 mL) as an additional repository of CO\textsubscript{2} gas using 250- or 500-mL serum bottle. Three mL of aqueous ammonia was spiked into the electrolytes to provide alkalinity for carbonate mineralization before or after CO\textsubscript{2} purging. The results showed that the efficiency of the carbonate mineralization was higher with Ca\textsuperscript{2+} electrolytes or in the presence of headspace than that with Mg\textsuperscript{2+} electrolytes or in the absence of headspace using Mg\textsuperscript{2+}, respectively. It is interesting that different types of carbonate minerals were precipitated from Ca\textsuperscript{2+} electrolytes when the order of the base addition was switched. Calcite was the dominant carbonate phase when the base was injected before CO\textsubscript{2} purging, while vaterite was formed when the base was injected after CO\textsubscript{2} purging. These preliminary results suggest the important factors affecting the efficiency of carbonate mineralization that need to be further investigated.

※ keyword: mineral carbonation, CO\textsubscript{2}, gas-water exchange reactions, optimal conditions

※ Funding institution & Project title: Korea South-East Power Co., Microalgae cultivation for carbon dioxide reduction in the exhaust gas of thermal power plants

※ Oral/Poster Presentation: Oral Presentation ☐ Poster Presentation ☑