

Carbonate mineralization of Bischofite under a mild condition

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Minerals rich in Mg are promising raw material for carbon dioxide (CO₂) sequestration because of their sufficient amount on earth. It has been reported that Qaidam Basin—located in the northwest of China—stores more than 2 billion tons of Bischofite (MgCl₂·6H₂O), which theoretically can sequester more than 800 million tons of CO₂. Furthermore, Bischofite is a byproduct of sea water desalination, which could also be utilized by areas close to shoreline for CO₂ sequestration purpose.

A new Mg²⁺ based CO₂ mineral sequestration process has been designed to optimize the carbonation reaction rate under mild conditions. In this process, ammonia is used as a base to keep pH of absorption solution in suitable ranges avoiding formation of Brucite [Mg(OH)₂]. In addition, due to the extremely high solubility of Bischofite, no extra energy is needed to leaching Mg²⁺. The maximum CO₂ absorption efficiency can reach 98% if CO₂ residence time Tr was kept around 15s, accompanied by the highest nesquehonite production rate of 0.24 mol·L⁻¹·h⁻¹. XRD and TGA analysis show that 95% of the solid product is nesquehonite. The successful test of the new CO₂ mineral sequestration process confirms its potential to be pushed to large-scale industrial application in future.