

DIRECT GEOLOGICAL DAMPING OF SODIUM CARBONATE GEL FOR CO₂ SEQUESTRATION IN SHALLOW AQUIFER

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Abstract

In this study, a possibility of carbon dioxide (CO₂) sequestration has been discussed by focusing on the aqueous gel of sodium carbonate (Na₂CO₃; SC) forming by absorbing CO₂ gas in water solution of sodium-metasilicate-hydrates (Na₂SiO₃·9H₂O; S-MS). Modifications to the process to eliminate the stripper section and focus on just the CO₂ gas adsorbing in S-MS solution can lead to reductions in the CO₂ capture cost compared with a CO₂ capture process using ordinal chemical absorber. Furthermore, the direct geological dumping of SC aqueous gel into a shallow aquifer has the advantages in storage capacity and safe geological sequestration compared with the ordinary CCS into deep aquifers by injecting super-critical CO₂, because the shallow aquifer has higher permeability and porosity, and SC aqueous gel is fairly stable and immovable to pressure and temperature changes even in a shallow aquifer with likely leakage paths. More savings on the energy costs for compression and cooling of the captured CO₂ gas can be realized if the aqueous gel is directly geological dumped into a shallow aquifer by injecting gel slurry. The direct geological dumping system of SC aqueous gel into shallow aquifers, proposed here, is expected to be suitable for small on-site CO₂ sequestration within land facilities such as power, steel mills and cement plants.