Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.29408

Enhanced weathering of alkaline waste materials for CO_2 mineralisation

KASPER K. MIKKELSEN, ALEXANDER BUHL, PETROS KANELIS, DORTHE LYBYE, ERIK HANSEN AND SUSAN LOUISE SVANE STIPP

Technical University of Denmark

On site, large scale mineralisation of CO_2 from point sources can become a central Carbon Capture & Storage (CCS) technology to help decrease CO_2 in the air and oceans. Carbonate minerals are readily formed when CO_2 is absorbed into an alkaline solution containing divalent cations such as calcium. At the same time, waste materials containing divalent cation carbonates can potentially be upcycled to new, valuable materials, as part of the mineralisation process.

We studied simultaneous dissolution of alkaline waste materials and CO_2 mineralisation in 20 L reactors, in batch and multistage configurations. Solution pH and composition were determined from liquid samples and CO_2 absorption into solution was determined directly from the gas flow inlet and outlet concentrations. Using cation solution concentration and pH and the geochemical speciation program, PHREEQC, we estimated the amount of CO_2 that was mineralised.

Experiments show significant differences between CO_2 absorption and mineralisation potential depending on the initial leaching solution composition and the time and rate at which CO_2 is introduced into the system. The results contribute to our understanding of ex situ CO_2 mineralisation processes, which is central for developing economically and industrially feasible CCS technologies.