Optimizing Carbon Dioxide Sequestration Using Olivine and Sodium Hydroxide in a Flow Through System

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Commercially viable carbon dioxide (CO2) sequestration with magnesium silicates, such as olivine, is still primarily experimental. My previous research showed a closed system containing olivine and sodium hydroxide (NaOH) sequesters CO2. However, the ideal concentration of NaOH, and whether sequestration via this method is possible in a commercially viable flow through system has not been determined. This experiment tests the hypothesis that a flow through system is possible and that higher concentrations of NaOH will be more effective at CO2 sequestration. Treatments of olivine combined with 0M, 0.1 M, 1M, and 2M NaOH were placed in a pipe through which a mixture of 5000 ppm CO2 was bubbled through for 10 minutes. Treatments without olivine of the same NaOH concentrations were also tested. The ppm of CO2, from the outlet of the tube was measured to determine the amount of CO2 sequestered. Data collected showed an exponential decrease in CO2 as the NaOH concentration increased. Another four trials were conducted, lasting 2+ hours, using the 2M NaOH +olivine treatment to see how well the treatment could sequester CO2 over a longer time period. In these trials, CO2 levels increased over time due to decrease in NaOH concentration. In conclusion, this experiment shows it is possible to sequester CO2 via NaOH and olivine in a flow through system and the best method of CO2 sequestration tested was the combination of 2M NaOH and olivine. However, new NaOH solution has to be added to maintain optimal sequestration rates over longer time periods.

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