Removing Carbon Dioxide from Coal Exhaust via an Olivine and Sodium Hydroxide Filter

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Carbon dioxide (CO_2) emissions from burning coal for industrial and energy purposes account for a sizable portion of the United States total CO_2 emissions. Commercially viable CO_2 sequestration with magnesium silicates, such as olivine, is still primarily experimental. My previous research showed that the forsterite variety of olivine and 2M sodium hydroxide (NaOH) is able to sequester 5000-ppm CO_2 quite well in a flow through system. However, coal exhaust differs from 5000-ppm CO_2 air mixture in that it has: considerably higher concentrations of CO_2, a wide range of other chemical pollutants (some of which react with NaOH), and high levels of particulate matter. In order to test the effect of such differences on an olivine-NaOH filter's ability to sequester CO_2, a flow through system was designed. Exhaust from burning coal was bubbled through a 2M NaOH and olivine filter as well as a filter containing only water. CO_2 readings were taken both before and after the exhaust passed through the filters in order to determine each filter's efficacy at removing CO_2 from coal exhaust. When using an olivine-NaOH filter there was a 47.28% average decrease in CO_2 levels after exhaust passed through the filter. This decrease is significantly greater than the 1.16% average decrease in CO_2 levels with the water only filter. In conclusion, results from this experiment indicate that an olivine-sodium hydroxide filter is indeed capable of sequestering CO_2 from coal exhaust, and as such, may have applications for CO_2 sequestration systems in industrial settings such as coal fired power plants.

Awards Won: