Optimization of CO2 Calcination Using a Nickel Catalyst and Varying Concentrations of Calcium

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The purpose of this experiment is to reduce the environmental impact of burning fossil fuels by removing carbon dioxide from the flue gas that is the produced during this process. CO2 is a primary greenhouse gas and its concentration in the atmosphere has risen greatly since the combustion and use of fossil fuels began. Ultimately, this problem can only be fixed by using cleaner sources of energy, but for the present carbon capture and storage technologies can be implemented to curb carbon dioxide emissions. These processes involve removing CO2, either from fuels before combustion or from the gases produced during combustion, and then transporting and storing the carbon dioxide in a place where it is kept separate from the atmosphere. One method is the mineralization of CO2 through the reaction with calcium oxide. This reaction presents both benefits and drawbacks, one being the slow second phase of the reaction that results in a less efficient system. This particular drawback can be dealt with by the addition of a nickel catalyst that would prolong the fast first phase of the reaction, increasing overall efficiency. The engineering goal was to optimize the CO2 capture using different concentrations of CaO and Ni. Of the 400 ppm CaO trials, with varying percents of Ni, the 6.25x10-3 % Ni was the most efficient. Of the trials with 6.25x10-3 % Ni and different concentrations of CaO, the 800 ppm was the best sorbent, but there was not a significant difference between it and the 400 ppm CaO solution.

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