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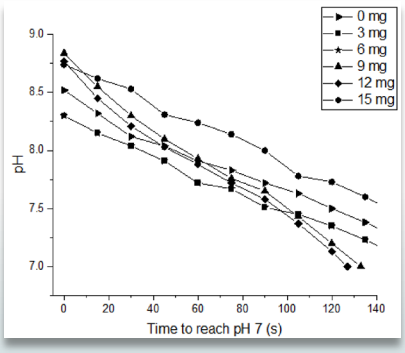
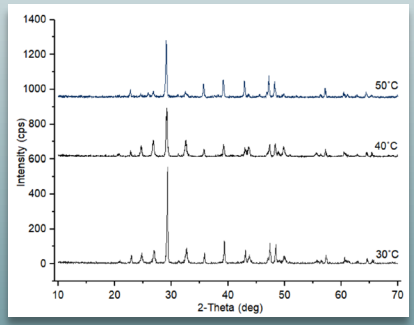
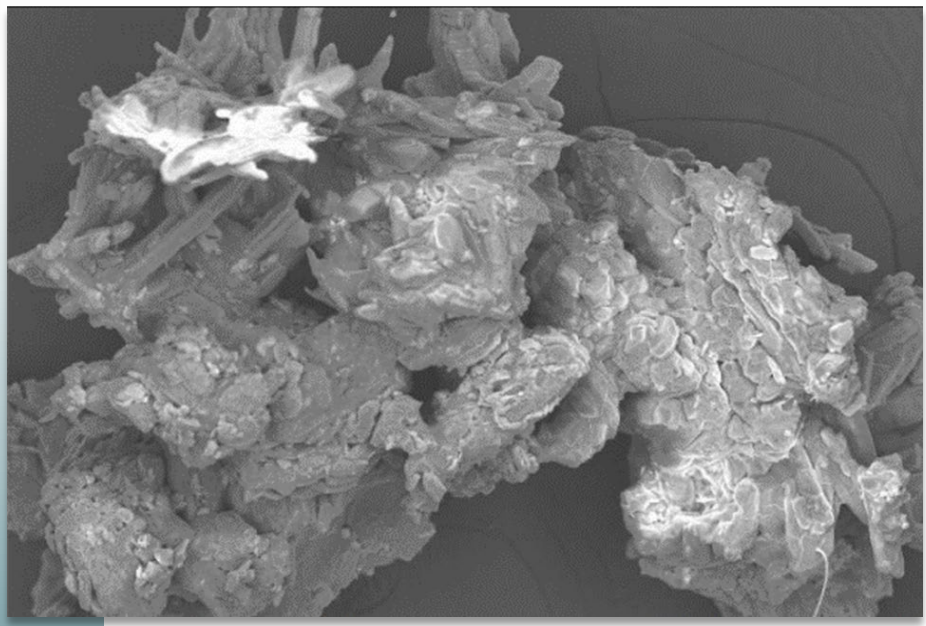
ZINC CYCLEN DEVELOPED FOR CARBON DIOXIDE HYDRATION PROCESS



Effect of Zn – Cyclen loading to the time taken to reach pH7



XRD analysis of $CaCO_3$ at different temperature reactions



Our study found that Zinc-cyclen can accelerate hydration and precipitation processes, with the amount of precipitated $CaCO_3$ and the time it takes for the solution to reach pH 7 influenced by CO_2 pressure and Zinc-cyclen concentration. Higher CO_2 pressure led to more precipitate $CaCO_3$ mass, but it took longer for the solution to reach pH 7.0. The optimal Zinc-cyclen concentration was 0.6 g/L, resulting in 1.845 g of $CaCO_3$ precipitate and 9.36 minutes to reach pH 7.0. The study suggests that Zinc-cyclen concentration has a marginally significant impact on precipitate production and time to reach pH 7.0.

CO_2 emissions, primarily caused by burning fossil fuels, are a major contributor to global warming. Multinational efforts are developing CO_2 hydration technologies to combat climate change, such as using biomimetic complexes resembling Carbonic anhydrase (CA). Simulating (CA) is an efficient and sustainable method for reducing CO_2 emissions. Naturally occurring (CAs) and their clones are being explored for CO_2 collection methods. Alcohol, such as ethanol, is used for CO_2 hydration due to its accessibility and non-poisonous nature. Zinc (II) cyclen, a small molecule CA mimic, was examined under harsh conditions, showing that absolute ethanol inhibited the catalyst's activity. Zinc-cyclen has a 5-fold lower activity and slower CO_2 hydration kinetics than CA. Improving small molecule CA mimics is crucial for their continued performance in industrial settings.

Our recent research aims to optimize the efficiency of the CO_2 hydration process by varying Zinc-cyclen concentration and pressure, analyzing the morphology of Zinc-cyclen and precipitates, and evaluating the performance of Zinc-cyclen using the CO_2 hydration process as the study method.

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