Developing a Solution to Ocean Acidification Using Excess Carbon Dioxide from Power Plants with Nickel Nanoparticles

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According to NOAA, “the ocean absorbs about a quarter of the CO2 we release into the atmosphere every year.” The significant increase in atmospheric carbon dioxide (CO2) concentrations results in ocean acidification, decreasing solution pH levels. If the ocean continues to absorb the excess CO2 at current rate, severe damage to the ocean environment will occur within the next century as current research demonstrates that the increased CO2 concentration inhibits the development of some corals and harms multiple shell organisms. It has been known that Sea Urchins’ biomimicry allows CO2 to be converted to calcium carbonate precipitates via catalytic activities of nickel nanoparticles (NiNPs) to form their calcium carbonate skeletal structure. Inspired by this biomechanism, a thorough investigation for precipitation of calcium carbonate by NiNPs catalyst would have great potential to remediation of ocean acidification. The focus of this research is on developing an inorganic solution to reduce the anthropogenic release of CO2 using a water tank system with NiNPs to form a calcium carbonate precipitate. A nickel nanoparticle aerogel (for immobilization) would be cost effective because of its reusability making it a feasible solution for absorbing CO2 as opposed to carbon anhydrase. The calcium carbonate precipitates would then be deposited in the ocean to regulate the pH by acting as a base in areas that are at risk because of ocean acidification. Current data collected shows that NiNPs can increase the rate at which CO2 is absorbed and produce a significant amount of calcium carbonate precipitate to be deposited.