



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

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Project Title
An Electrolytic Approach to Ocean Water Restoration

Abstract

Objectives/Goals
The major objectives were to determine:
I. Exactly how much activated CaSiO₃ (and thus HCl) and how much NaOH [electrolytic components] would be needed to neutralize multi-current system ocean water to pre-industrial acidity levels. (And consequently whether the figures obtained would fit into the NSG-habitable bracket.)
II. How this amount varies throughout the three non-polar ocean systems based on average pH (carbonic acid-titrated ECmII)

Methods/Materials
Indian, Atlantic, and Pacific ocean current systems were isolated in a gas infusion chamber for the H₂CO₃ genesis to the correct molarity to yield desired pH. Salinity was titrated and confirmed using refractometer readings. Titration conducted first with NaOH and second with globulated CaSiO₃. Measurements checked 4X to confirm data: standard variation found to be reassuringly minimal. Data successfully replicated, data extrapolation revealed volumes in habitable bracket.

Results
Pacific Simulation (200mL) 0.121 mL CaSiO₃ 0.312 mL NaOH
Atlantic Simulation (200mL) 0.261 mL CaSiO₃ 0.574 mL NaOH
Indian Simulation (200mL) 0.310 mL CaSiO₃ 0.665 mL NaOH

Conclusions/Discussion
"Electrolytic" approach still feasible, but given proximity to upper end of HB, especially NaOH, likelihood of application if action not taken immediately is dismal. Global warming's slow advance is largely due to the global ocean's capability to sequester CO₂. With acidification (H₂CO₃ formation), however, this sequestration capability is greatly diminished. With an implementation of the electrolytic approach in either a biological or strictly chemical strategy, much of the worst effects of increased atmospheric CO₂ can be kept at bay until anthropogenic carbon emissions diminish significantly without adversely affecting marine biota.

Summary Statement
My project explores a possible way to neutralize ocean water carbonic acid without damaging marine ecosystems and simultaeneously sequester atmospheric CO₂.

Help Received
Used lab equipment at Penner Lab (Bldg. 402, UCI)