



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

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Project Title Controlling Crystal Growth	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The goal of this project was to establish the best growing conditions for the earth alkaline carbonates (Magnesium, Calcium, Strontium, and Barium), considering temperature and concentration, in order to obtain nice, single crystals with distinct crystal shape and size.</p> <p>Methods/Materials The crystals were grown above saturation concentration for each alkaline earth carbonate, by choosing at least three different concentrations and two different temperatures: (4C and room temperature). Highly soluble earth alkaline salts (chloride or nitrate) reacted with ammonium bicarbonate to form earth alkaline carbonate in a double replacement reaction. The obtained crystals were examined under a microscope that was connected to a computer and shape, size, and density of the crystals were recorded.</p> <p>Results All carbonate crystals grew only at concentrations at least 50 times higher than their saturation concentration. The best growing conditions for calcium carbonate were 5mM concentration at room temperature and 10mM at 4C. The crystals grown at 4C had an average size of 60 um versus 30um at room temperature. The crystal density was about the same for both temperatures. Strontium and Barium grew big, single carbonate crystals best at room temperature. For strontium carbonate a 10mM salt concentration resulted in a crystal size of 80um. Barium carbonate grew best at 5mM concentration. The crystals size was 100um. Magnesium carbonate crystals did not grow well in this set-up. Only a few crystals grew at a concentration of 250mM and they dissolved before they could be counted.</p> <p>Conclusions/Discussion Many things influence crystal growth. While the shape or morphology of the crystal depends only on the earth alkaline ion, the size and number of the carbonate crystals depend directly on temperature and on concentration. Interestingly strontium and barium grew bigger carbonate crystals at room temperature while calcium grew bigger crystals at 4C. Magnesium carbonate crystals dissolved, because the crystals probably attracted water from the air very easily. These results will be useful in Material science, because these crystals can be used as #building blocks# to form high tech mixed crystals.</p>	
Summary Statement The project investigates how temperature and concentration affect earth alkaline carbonate crystals# growth, size and shape.	
Help Received Lab equipment and chemicals were used from the lab of Professor Daniel Morse, UCSB under the supervision of a graduate student: James Weaver.	