



**CALIFORNIA SCIENCE & ENGINEERING FAIR  
2019 PROJECT SUMMARY**

<b>Name(s)</b> <b>Raven Alvarez</b>	<b>Project Number</b> <b>J0603</b>
<b>Project Title</b> <b>Using Chemistry to Remove Carbon Dioxide from the Atmosphere</b>	
<b>Abstract</b> <b>Objectives</b> The purpose of this project is to find a chemical reaction that removes (scrubs) carbon dioxide gas from semi-fixed sources, without needing to store pure carbon dioxide as a gas, but instead creating a molecule, that is not harmful to the environment, to be stored as a solid. I hypothesised that if the equation $H_2O + CaCl_2 + CO_2 \Rightarrow CaCO_3 + 2HCl$ is used to remove carbon dioxide from the atmosphere, then calcium carbonate would precipitate to the bottom of the solution and will be easily removed and stored, making it an effective and efficient way to remove carbon dioxide from the atmosphere. <b>Methods</b> To test my hypothesis I added 10g of calcium chloride to 227g of deionized water then pumped carbon dioxide through the solution. The vessel was on scale so I could record the change in mass over the course of 12 minutes. I bubbled carbon dioxide through the solution for the first 3 minutes, noting the change in mass every minute. I continued to monitor the amount of carbon dioxide in the solution or released out of it until the 12 minutes was over. After I did this I compared it to the amount of mass the solution hypothetically should have gained due to carbon dioxide sequestration to the mass it actually gained, discovering if calcium chloride is an efficient chemical to use. <b>Results</b> During my experiments no carbon dioxide was permanently removed from the atmosphere. Although the solution did gain an average of about 1.7g while the carbon dioxide was still being added, at the end of the 12 minutes the mass was always back to its original mass, making calcium chloride an inefficient way to remove carbon dioxide from the atmosphere. <b>Conclusions</b> Through doing my experiment I learned that calcium chloride is not an effective way to sequester carbon dioxide and store it as a solid. This is because once the chemicals bonded together, it created hydrochloric acid along with the calcium carbonate, and the calcium carbonate reacted to hydrochloric acid, creating an equilibrium and forcing it to the left side of the chemical equation. This means that I will need to use a new chemical to take carbon dioxide out of the atmosphere to help fight climate change. After I have found a chemical that I can use to efficiently remove carbon dioxide from the atmosphere and convert it to a non-hazardous solid, I would like to build a carbon scrubber that can be place in different areas to help reduce the effects of climate change.	
<b>Summary Statement</b> Through experimenting, I found that calcium chloride, when in a solution with deionized water, is not a chemical that can effectively take carbon dioxide out of the atmosphere and convert it into environmentally safe solid.	
<b>Help Received</b> I was loaned a scale to measure the different masses by the Hoopa Tribal Fisheries Dept. and I was provided calcium chloride by my science teacher, Nicholas Dedini. I also received advice from Chris Harmon, an Humboldt State University Chemistry professor.	