



**CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY**

Name(s) Echo Sit; Hilarie Sit	Project Number S0622
Project Title Catching the Greenhouse Culprit II, Extraditing the Culprit: Building and Recycling a Carbon Dioxide Filter at Home	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this project is to build an environmental friendly CO₂ filter that is safe and economical for home use, and a CO₂ absorbent recycling machine that is capable of recycling the CO₂ absorbent so that the CO₂ filter can be made reusable many times, as well as finding a way to utilize the extracted carbon dioxide from the recycling process so that it will have an overall negative carbon dioxide impact on the environment.</p> <p>Methods/Materials By adjusting carbon dioxide level to 1,000 ppm, the CO₂ absorption rate of equal molar of CaO, MgO, and ZnO absorbents were determined and compared via a CO₂ monitor and a timer. Then the experiment was conducted with the constructed filter machine so as to determine the efficacy of the machine for improving the CO₂ absorption rate. For the recycling process, 10g of MgO was heated to 550 degrees Celsius for 2 min and weighed; then the procedure was repeated by increasing 2 min interval for 60 min.</p> <p>Results From experiment 1, ZnO was eliminated as absorbent material (too slow) and the Molar Equivalency Ratio of 1.56 was found for MgO. From experiment 2, the average efficacy percentage (20 min interval) are 343% for 1 mole of CaO, 436% for 1.5 mole of MgO, and 727% for 2 mole of MgO; also, by using 1.65 mole of MgO, the curve approximate well with that of 1 mole of CaO. From experiment 3, the rate of MgO production is obtained (Graph 3b) and an equation to describe the curve is found; for 80 min, at least 90% of the MgO was regenerated from MgCO₃.</p> <p>Conclusions/Discussion The main conclusions from this project are that MgO can be used as a CO₂ absorbent material and that the machine is efficacious in increasing the CO₂ absorption rate of the absorbents. Also the absorbent recycling machine is effective in converting MgCO₃ back to MgO. Despite the CO₂ absorption rate of MgO is slower than that of CaO, it is more suitable for home use due to its safety. In fact, when increase the amount of MgO to its Molar Equivalency Ratio, its CO₂ absorption rate can match that of CaO. Our filter is environmental friendly because the by-product, MgCO₃, can be reusable and recyclable by our recycling machine as demonstrated; also there are also many other uses of MgCO₃, such as in fire proofing and extinguishing materials and medicines.</p>	
Summary Statement This project is to build an environmental friendly CO ₂ filter that is suitable for everyday use at home and build a recycling machine to regenerate the absorbent material.	
Help Received Teacher taught us the exponential decay function; Father helped us with the safety of all experiments; Mother helped purchase the necessary materials. We would like to thank Mrs. Anderson and Ms. McKay for their support.	