Separating Carbon Dioxide from the Atmosphere to Help Minimize Global Warming, Year One

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Global warming is one of the world's greatest challenges and it is clear that reducing emissions will not stop the global warming process. Removing CO2 from the atmosphere is a necessity. The project's long term goal is to develop a system to be run at a home that can extract CO2 from the atmosphere. The first year goal was to take the first steps towards creating a gas separation system that produces higher concentrations of CO2. A zeolite pressure swing adsorption system design was modified to create a simpler and cheaper single cylinder system to separate the atmospheric gas mixture into two gas streams. One stream was an oxygen rich mixture with Argon and CO2 and the other stream was a nitrogen rich mixture with CO2. Tested using a variation of pressures and hold times. The next step took hydrogen from an electrolysis system and using a fuel cell, combined the hydrogen and oxygen to eliminate the oxygen from the oxygen rich mixture. The redesigned adsorption system separated the air into two mixed gas streams and achieved the expected 25% of the original CO2 in the oxygen rich mixture and 75% in the nitrogen rich mixture. A critical result was determining an optimal pressure/hold time combination of 20 psi and 20 seconds. The new adsorption process was successful in separating the air into the expected gas mixtures and is a good starting point for the next step of further separation of the resulting gas streams.

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