Analyzing and Applying Biological Charcoal for High-Concentration Carbon Dioxide Storage

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Biological Charcoal, or Biochar, is one of the most promising tools recently found for effective carbon capture and sequestration. Biochar is capable of binding to CO_2 through a process called physisorption, which loosely connects CO_2 to biochar's surface. Typical applications of Biochar utilize it as the final receptor for CO_2, however prior testing has shown that it can only absorb a relatively small quantity of CO_2, albeit at a fast rate. This project aimed to remedy this discrepancy by applying biochar not as a final receptor, but as an incredibly efficient intermediary. Facilitating this application, the hypothesis stated that if saturated Biochar were placed in an isolated environment, high-concentration CO_2 could be extracted with constant efficiency. To do so, this project required a two-fold goal: determining methods of on-demand carbon detachment, and applying these methods to establish high-concentration CO_2 storage. After varied experimentation, heating Biochar to above 90C was found to be the key to complete, on-demand CO_2 removal. Cyclic heating tests were conducted 6 times, revealing Biochar to be almost 99% efficient at reabsorbing CO_2. To apply this knowledge, a modified Boyle's law Apparatus was used to isolate and extract the pure CO_2. This proved to be highly successful, filling a 16g CO_2 cartridge from a vacuum to 1 atm in just 3 cycles of 20ml of biochar. Overall, this project highlights the viability of a novel form of carbon sequestration, which plays to Biochar's strengths and could be crucial in modernizing and accelerating the fight against climate change.