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Abstract - Conversion of Atmospheric CO2 to Solid Carbon: A Climate Change Mitigation Strategy

Climate change driven by ever increasing amounts of greenhouse gasses like CO2 is one of the greatest threats to humankind. While newer technologies such as solar panels and electric vehicles are helping reduce the rate of increase of additional CO2 into the atmosphere, it is being projected that these measures will not be enough to avoid major damage to the global ecosystems. Scientists have been exploring additional carbon capture and sequestration and utilization technologies. These could help with removing greenhouse gasses that are already in the atmosphere. I have conducted a literature survey of carbon capture and utilization technologies to get a feel of various technologies being developed. Based on my search, I came across a research paper by Australian scientists that appeared in January 2022 describing a liquid metal catalytic reduction of CO2 to solid carbon at ambient temperature and pressure, that appeared to be viable as a scalable and simple process.

I have independently re-enacted this breakthrough process through the use of a liquid metal gallium-indium eutectic. Carbon dioxide was bubbled through a liquid metal to catalytically reduce into solid carbon. A glass bubble column reactor was designed and fabricated. The eutectic alloy made of Gallium and Indium was made and added to the bubble reactor. Using heating tape, the reactor was kept at 100-150 deg C. CO2 was bubbled through the liquid metal in the reactor. After 24 hours, a solid carbon layer was clearly visible at the top. After bubbling for 24 hours a total CO2 amount of about 6-7 liters at atmospheric pressure and room temperature, carbon amount was estimated to be a few grams in weight.