CO_2 Capture and Reduction Utilizing Metal Oxide, Electrolyte and Liquid Metal Electrocatalyst

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Carbon dioxide (CO_2) is one of the most potent greenhouse gases contributing to climate change, trapping heat and raising the average temperature of the atmosphere. There are a lot of talks to reduce CO_2 production and emission among developed countries through The Paris Agreement. However, there are very little conversations about how to reduce the amount of existing CO_2 in the atmosphere because it is a daunting task to tackle it due to its physical scale and economics that needs to support it. In this project, I propose a method to capture and reduce CO_2 back to carbon form. There are number of ways to capture CO_2 using chemicals. One is using organic materials such as amines and the other is using inorganic materials such as metal hydroxide. After testing numerous chemicals, methanolamine in the organic chemical group and sodium hydroxide in the inorganic group stood out due to their efficiency in capturing CO_2 and also the environmental impact they have. The reduction of CO_2 to carbon is the most challenging part due to the fact that it requires very high temperature, therefore, consuming a lot of energy. However, it is possible to reduce CO_2 back to carbon using liquid metal catalysis, comprising gallium, indium, tin and cerium, and applying small amount of electrical voltage and current. This CO_2 capture technique shows promise in real world applications by combining the CO_2 capture with metal hydroxide and carbon reduction with liquid metal catalyst.