Eco-Friendly Generation of Methane and Oxygen From Atmospheric Carbon Dioxide and Water Through the Sabatier Process

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The Sabatier reaction is a method of producing methane from gaseous hydrogen and carbon dioxide through heating in the presence of a nickel catalyst. This reaction has many potential applications - from acting as a stopgap in our full transition to renewable energy to reducing launch costs on Mars by producing rocket fuel on-site. In this project, we built a reactor capable of producing around 3 grams of methane per hour. The reactor captures carbon dioxide from the atmosphere using a solution of monoethanolamine, produces hydrogen from electrolysis, and then performs the Sabatier reaction in the presence of a nickel catalyst. We ensured the product was methane by observing a drop in pressure and by confirming the flame color of the product was blue in the presence of excess oxygen. The reactor is automated, with a microcontroller monitoring the pressure and temperature of the various reaction vessels, and can be controlled wirelessly with a laptop.

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