Removing Carbon Dioxide from our Atmosphere: Using Porous Crystalline Materials for CO2 Capture

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Carbon emissions from the energy and transportation sectors are the most significant contributors to the increase in the concentration of greenhouse gases in our atmosphere. Increasing greenhouse gases in the atmosphere causes global warming. Our atmosphere is home to more than 34 gigatons of carbon dioxide; 1.3 gigatons (or ~4%) of the CO2 was produced between 2009-2010. The growing concern about global warming is placing greater demands on improving energy efficiency of processes and on reducing CO2 emissions. The U. S. Department of Energy has shown that separation of CO2 represents 75% of the overall cost associated with separation, storage, transport, and sequestration. Therefore, more energy efficient CO2 separation processes are needed. My science fair project evaluated Prussian Blue and Metal Organic Framework (MOF) type absorption media for the capture of CO2. CO2 absorption data was compared to other commercially available absorption media and the DOE baseline approach for CO2 removal. The data showed that MOF materials have over 100x larger adsorption capacities over the DOE baseline approach and between 1.5 – 3x absorption capacities over Prussian Blues and Zeolite materials.