

Carbon Dioxide Capture and Storage Utilizing Metal Hydroxides and Biochar

Huh, Grace (School: Westwood High School)

Carbon dioxide is one of the most controversial atmospheric gasses due to its greenhouse effect on global climate. There are many discussions and agreements about how to reduce the production and release of carbon dioxide. However, regulating future emission of CO₂ does not address the impact of what has been already released for the past several decades.

Unfortunately, removing the existing carbon dioxide in the atmosphere is a challenging task due to its chemical stability. This project proposes two methods to capture CO₂ and store it permanently. The first path is to use Alkali metal hydroxides, which are known to be efficient at CO₂ capture and subsequently forming metal carbonates. Carbonates have numerous applications and therefore, provide a path to permanently storing the captured carbon from CO₂. There are two important factors to consider for this path: CO₂ should not be emitted during metal hydroxide production and the metal carbonates should be safe to be stored or used for other applications. Different metal hydroxides were compared for their CO₂ capture capacity and environmental impact. The second path for capturing CO₂ is using biological charcoal (biochar). Biochar adsorbed CO₂, but not as fast as the metal hydroxides. The temperature, time and surface area are key parameters in improving the CO₂ capture efficiency. Biochar is made from abundant biomass and known to be beneficial to the environment since it retains water and nutrients for the soil and has little negative effect. Therefore, biochar is a very strong candidate for storing CO₂ in farm lands over metal hydroxides.

Awards Won: