

Utilizing the Limestone Cycle to Reduce Net Atmospheric CO₂ While Simultaneously Producing Electricity

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Carbon dioxide (CO₂) is a major contributor towards the advancement of global warming as per scientific community consensus. Atmospheric levels of CO₂ hit an all time high in 2015 as per a United Nations report. The UNFCCC (United Nations Framework Convention on Climate Change) has attempted to set goals to reduce carbon emissions via the Kyoto Protocol and subsequently by the Paris Climate Accord. The purpose of this innovation is to reduce net atmospheric CO₂ by utilizing the Limestone Cycle and moving the world towards fulfilling the goals set out by UNFCCC. It was hypothesized that by using the Limestone Cycle this innovation can undergo a two-step reaction that results in net negative atmospheric CO₂. The first stage involves calcium carbonate becoming calcium oxide and CO₂ by thermal decomposition. This CO₂ is sequestered for long term storage. As calcium oxide is unstable, it adsorbs atmospheric CO₂ to form calcium carbonate. From experimentation, 60kg of limestone can remove approximately 25.2kg of net atmospheric CO₂ per 24 hour period. There is 32.7 kWh of electricity produced as a byproduct of this innovation. A scaled prototype was constructed. A photo-voltaic heat source is being investigated to make the process greener and thereby having a higher net atmospheric CO₂ reduction. This is the first innovation of its type, it has both industrial and residential applicability at local, national, and global levels.

Awards Won:

ASU Rob and Melani Walton Sustainability Solutions Service: Award of \$1,000