

“FIXING CARBON DIOXIDE”

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Abstract: Catalysis of the conversion of carbon dioxide to liquid fuels using solar and electrical energy is a critical global challenge that will positively impact the carbon balance by recycling CO₂ as fuels. The importance of catalyst turnover frequency in the overall efficiency of the conversion of solar energy and CO₂ into chemical fuels will be discussed. The state of the art in natural and artificial catalysts for the chemical reduction of CO₂ will be reviewed. The improvement in the activities of several rhenium based catalysts, and infrared spectroelectrochemical studies that probe the mechanism of catalysis will be described. Recent improvements in CO₂ reduction catalyst rates and lifetimes have allowed the photochemical “splitting” of CO₂ to CO and O₂ to be achieved. The overall solar efficiencies for the sequestration and conversion of CO₂ to CO will be compared to conversions to biomass. Preliminary studies of the activation and reduction of CO₂ from atmospheric (380 ppm) concentrations will be presented.