

Carbon Dioxide Fixation on Plasmonic Catalysts

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Producing fuels through CO₂ recycling, particularly powered by abundant light energy, offers a promising opportunity for a sustainable energy supply. This talk presents the approach of using plasmonic nanoparticles as a new class of photocatalysts for directly producing hydrocarbons in the presence of H₂O, CO₂, and visible light. Visible-light plasmonic excitation of Au nanoparticles drives CO₂ reduction reaction with a promoter, producing higher energy density fuels than C₁, e.g., C₂₊ hydrocarbons that need additional electron and proton transfer as well as C-C bond formation steps. A combined study of experiment and theory shows that the magnitude of chemical potential contributed by plasmonically generated charge carriers plays a key role in the reaction selectivity, which is dependent on the concentration of photon. The findings show that the light attribute serves as a major contributor to controlling reaction pathways in plasmonic photosynthesis.