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Alternating Magnetic Field Enhances Photocatalytic CO2 Reduction

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Abstract

Solar CO2 reduction via photocatalysis enables sustainable carbon-cycle utilization, yet a challenge to date because of the relatively low conversion efficiency. Herein, we demonstrate that this photocatalytic process could be significantly improved by coupling an alternating magnetic field (AMF). Using NiO/TiO2 as a model photocatalyst, CO2 could be converted into CH4 in the presence of H2O vapor. Integrating with AMF, the conversion of CO2 to CH4 increased by 213%. The enhanced photocatalysis process by AMF coupling can not only increase the carrier density by inhibiting the combination of photogenerated electron-hole pairs, but also improve the oxidation ability of the catalyst under simulated sunlight, and promote the conversion of H2O to O2. Our investigation also elucidates that the Ni species act as the adsorption/activation sites of CO2 to promote the reduction of CO2 to CH4. This work opens a new research door in solar CO2 reduction by integrating AMF into photocatalysis.

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