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Visible light photoreduction of CO_2 using CdSe/Pt/TiO_2 heterostructured catalysts CHRISTOPHER MATRANGA, CONGJUN WANG, ROBERT THOMPSON, JOHN BALTRUS, U.S. Dept of Energy — A series of CdSe quantum dot (QD) sensitized TiO_2 heterostructures have been synthesized, characterized, and tested for the photocatalytic reduction of CO_2in the presence of H_2O. Our results show that these heterostructured materials are capable of catalyzing the photoreduction of CO_2 using visible light illumination ($\lambda > 420$ nm) only. The effect of removing surfactant caps from the CdSe QDs by annealing and using a hydrazine chemical treatment have also been investigated. The photocatalytic reduction process is followed using infrared spectroscopy to probe the gas phase reactants and gas chromatography to detect the products. Gas chromatographic analysis shows that the primary reaction product is CH_4, with CH_3OH, H_2, and CO observed as secondary products. Typical yields of the gas phase products after visible light illumination ($\lambda > 420$ nm) were 48 ppm g^{-1} h^{-1} of CH_4, 3.3 ppm g^{-1} h^{-1} of CH_3OH (vapor), and trace amounts of CO and H_2.

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