Ceo_2-Tio_2 as a Visible Light Active Catalyst for the Photoreduction of Co_2 to Methanol

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ABSTRACT

The performance of CeO_2-TiO_2 photocatalyst for the photocatalytic reduction of CO_2 into methanol was studied under visible light irradiation. The as-prepared catalysts were characterized for their structural, textural and optical properties using X-ray diffraction (XRD), field emission scanning electron microscopy (FESEM), X-ray photoelectron spectroscopy (XPS), nitrogen physisorption analysis, UV-vis spectroscopy and photoluminescence (PL) spectroscopy. The characterization results indicated that the presence of CeO_2 stabilized the anatase phase of TiO_2, decreased its crystallite size, increased the surface area, reduced the band gap energy and lowered the rate of electron-hole pair recombination. The CeO_2-TiO_2 photocatalyst showed an increased methanol yield of 18.6 µmol/g under visible light irradiation, compared to the bare TiO_2(6.0 µmol/g).

KEYWORDS: ceria; TiO_2 photocatalyst; CO_2 photoreduction; visible light; methanol; rare earths