




Facile fabrication of visible light-driven CeO₂/PMMA thin film photocatalyst for degradation of CR and MO dyes

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Abstract

CeO₂/PMMA NCTF was successfully fabricated by a facile, room-temperature, inexpensive, and simple solution casting method. Ultra-violet, Fourier-transform infrared spectroscopy, X-ray diffraction spectroscopy, scanning electron microscopy, energy dispersive X-ray spectroscopy, transmission electron microscopy and X-ray photoelectron spectroscopy techniques have been used to scrutinize the structure and properties of CeO₂/PMMA NCTF. It has been found that the CeO₂ nanocubes are constantly dispersed into the PMMA matrix thus forming a thin film. Due to its unique structure, the CeO₂/PMMA NCTF has enhanced activity and selectivity towards the visible light-driven degradation of various organic pollutants. The photocatalytic degradation efficiency of the catalyst was tested against Congo red and methyl orange, selected as model organic contaminants. The synergistic effect of the catalyst reduces the electron-hole recombination rate and thus enhances the photocatalytic activity. Hydroxyl radical and super oxide radical ion species induce the photocatalysis which can be determined by trapping experiments. The synthesized CeO₂/PMMA NCTF can be reused several times without loss of activity, and a plausible mechanism was also proposed. It is hoped that our present effort may inspire further studies in new, efficient, recyclable photocatalysts and the degradation of organic contaminants driven by visible light.