Study of Photocatalyst Performance of CeO_2@TiO_2 Nanocomposite

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Abstract

In this study, hollow CeO_2@TiO_2 nanocomposite was prepared by a two-step method. Hollow CeO_2 microspheres were synthesized by spray pyrolysis process then anatase TiO_2 nanoparticles were deposited on sphere surface through sol-gel method. The thickness of TiO_2 shell was controlled by tuning the Ti/Ce ratio of the precursor. XAS analysis revealed that Ce^{3+} content was enhanced while Ti^{3+} content decreased after forming CeO_2@TiO_2 nanocomposite, which may due to the charge transfer from Ti to Ce. UV-vis spectra indicated the absorption edge was extended to visible light region and band gap was decreased. In PL spectra, peak intensity is decreased, predicting that the life time of photoinduced electron-hole pairs were prolonged which benefit to the formation of O^{2-} and ·OH. Photocatalytic activity was carried out by the degradation of methylene blue under UV light and visible light. The present results demonstrated that the photocatalyst performance of hollow CeO_2@TiO_2 nanocomposite will be improved significantly by optimizing the TiO_2 shell structure.

Keywords - CeO_2@TiO_2, XAS, photocatalyst.