Curcumin modified Titanium Dioxide Nanotubes with Enhanced Visible Light Photocatalytic Performance

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In this study, curcumin modified TiO₂ nanotubes (Cur-TNT) were prepared by a modified impregnation-electrochemical anodization method with 0.01, 0.025, 0.05 mM of curcumin concentrations. The physical properties of the Cur-TNT were studied by several techniques such as X-ray powder diffraction (XRD), scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDS), Fourier-transformed infrared spectroscopy (FT-IR), and UV-Vis diffused reflectance spectroscopy (DRS). The XRD patterns data revealed anatase phase for both the TNT sample and the Cur-TNT samples. The high magnification images from SEM technique showed that the TNT sample and the Cur-TNT samples possess nanotube-like structures with an average diameter of 85 nm. The FT-IR spectra exhibited the characteristic bands of the TiO₂ and hydroxyl groups on the TNT surface. Instead of hydroxyl groups, the characteristic bands of curcumin were observed on the surface of the Cur-TNT samples. The EDS results complementarily confirmed the existence of Ti, O, C as the main elements of the Cur-TNT samples. Interestingly, the DRS spectra of the Cur-TNT samples extended into the visible region. The photocatalytic properties of the Cur-TNT samples were evaluated from the degradation of methylene blue under visible light irradiation. It was found that the Cur-TNT samples exhibited higher photocatalytic performance than the TNT sample. A possible photocatalytic mechanism has also been proposed.

Keywords: TiO₂ nanotubes, Curcumin modified TiO₂, Electrochemical anodization method, Visible photocatalyst, Degradation of methylene blue

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