

Photocatalytic degradation of organic dyes using nickel oxide incorporated titania nanocatalyst

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ABSTRACT

In this present work, two-step methods were executed to prepare TiO₂/NiO nanocomposite material. The selected area electron diffraction and X-ray diffraction pattern were interpreted and their fallouts demonstrate the occurrence of the tetragonal structure of TiO₂ beside the cubic structure of NiO. The NiO nanoparticles were randomly distributed on the surface of TiO₂, which was seen by transmission electron microscopy (TEM) and elemental mapping analyses. The high-resolution scanning electron microscope (HR-SEM) images of the prepared materials represent the spherical-shaped nanoparticles. The prepared TiO₂/NiO material shows high purity because it contains Ni, Ti and O elements without impurities which were represented by energy-dispersive X-ray spectroscopy. The estimated band gap of the prepared TiO₂@NiO nanocomposite is in the UV region. Under UV light condition, the nanocomposite effectively exploits the colorful dyes like methylene blue and methyl orange. In addition, their photocatalytic mechanism has been explained in detail.

Keywords: Photocatalyst; Degradation; UV light; Methyl orange; Nanocomposites

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