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Photocatalytic degradation of environmental perilous gentian violet dye using leucaena-mediated zinc oxide nanoparticle and its anticancer activity(Article)

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Abstract

Abstract: Phytomediated synthesis of metal oxide nanoparticles has become a key research area in nanotechnology due to its wide applicability in various biomedical fields. The present work explores the biosynthesis of zinc oxide nanoparticles (ZnO-NPs) using Leucaena leucocephala leaf extract. The synthesised ZnO-NPs were characterised by ultraviolet–visible (UV–Vis) spectroscopy, scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDX), Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), transmission electron microscopy (TEM) and selected area electron diffraction (SAED) studies. Biosynthesised ZnO-NPs are found to have wurtzite hexagonal structure with particles distributed in the range of 50–200 nm as confirmed by TEM studies. The anticancer activity of ZnO-NPs against MCF-7 (breast cancer) and PC-3 (human prostate cancer) cell lines was evaluated using 3-(4, 5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay. From the assay, biosynthesised ZnO-NPs have better cytotoxic activity on PC-3 cell lines than MCF-7 cell lines. The in vitro cytotoxicity studies of biosynthesised ZnO-NPs against Dalton lymphoma ascites (DLA) cells reveal better antitumor activity of 92% inhibition with concentration of 200 $\mu g \cdot ml^{-1}$ of ZnO-NPs, and as the concentration increases, the anticancer efficiency as well increases, and also, it has excellent photocatalytic activity to degrade crystal violet dye in aqueous solution after irradiation of 90 min. The result suggests that the green synthesis of ZnO-NPs could be easily recovered and reused several times without any significant loss of the catalytic activity. The advantage of this technique lies in its low cost, easily climbable and non-use of toxic agents. Graphical abstract: [Figure not available: see fulltext.].

Author keywords

Catalysis | Nanostructured materials | Scanning electron microscopy | X-ray diffraction

Indexed keywords

Engineering controlled terms: Biochemistry | Catalysis | Catalyst activity | Cell culture | Cells | Diseases | Electron diffraction | Electrons | Energy dispersive spectroscopy | Fourier transform infrared spectroscopy | High resolution transmission electron microscopy | II-VI semiconductors | Metal nanoparticles | Metals | Nanostructured materials | Scanning electron microscopy | Synthesis (chemical) | Transmission electron microscopy | X ray diffraction | Zinc sulfide | ZnO nanoparticles

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