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Photochemical and Chemical sensing utility of synthesised ZnO nanoparticles: Effect of Surfactants

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Well-crystalline ZnO nanoparticles (NPs) have been synthesized in the presence and absence of surfactants (CTAB, 12-2-12 Gemini surfactant) at low temperature 65°C by facile simple solution process. The synthesized NPs have been characterized in detail using different characterization techniques viz. UV-Visible spectroscopy, powder X-Ray Diffraction(XRD), Energy Dispersive Spectroscopy (EDS) and Field Emission Scanning Electron Microscopy (FESEM). The UV-visible spectrum exhibits the peak in the range of 363 -369 nm which are characteristic of ZnO nanomaterial. The characterization techniques revealed that the prepared samples are well crystalline having sheet-like shape and possessing wurtzite hexagonal phase. The crystal size of ZnO NPs prepared in the presence of CTAB and Gemini surfactant has been found 28.33 nm and 20.8 nm respectively, while 25.68 nm in the absence of surfactant. From the FESEM study, capping ability of CTAB has been confirmed. The applicability of these NPs has been checked to degrade hazardous methyl orange (MO) dye under UV irradiation. Moreover, the sensitivity of ZnO has been confirmed by the detection of PNP (p-Nitrophenol) within the detection limit to be 4.35 μ M, 8.40 μ M in the presence of CTAB and Gemini surfactant respectively whereas 9.85 μ M in the absence of surfactant. Thus, we find that ZnO nanomaterial prepared by simple solution process holds potential as an efficient photocatalyst and highly sensitive chemical sensor for environmental remediation.

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