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Smart chemical sensor and active photo-catalyst for environmental pollutants

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ABSTRACT

In this contribution, nanoparticles composed of $ZnO–CeO_2$ were synthesized by simple and efficient low temperature process and employed for the development of effective chemical sensor as well as photo-catalyst for the removal of environmental contaminants. Field emission scanning electron microscopy (FESEM), X-ray powder diffraction (XRD), Raman spectroscopy and Fourier transform infrared spectroscopy (FTIR) were used to confirmed the morphology and structure of the synthesized $ZnO–CeO_2$ nanomaterial which revealed well crystalline aggregated nanoparticles with average diameters of $\sim 50 \pm 10$ nm. The composition of the nanoparticles was obtained by using EDS spectroscopy while the optical property was measured using UV–vis absorption spectrum. Photocatalytic degradation of acridine orange (AO) and methylene blue (MB) dyes has been carried out using $ZnO–CeO_2$ nanoparticles, which showed 92.1% degradation for AO and 80.7% degradation for MB in 170 min of irradiation time. The analytical performance of $ZnO–CeO_2$ nanoparticles fabricated ethanol sensor exhibited higher sensitivity ($2.1949\ \mu A\ cm^{-2}\ mM^{-1}$) as well as lower detection limit (0.6 ± 0.05 mM) in short response time.