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Characterization of ZnO–TiO_2-coated tapered fibres synthesized by a low-temperature hydrothermal method

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Abstract

We characterize ZnO-nanorod fibres doped with different concentrations of TiO_2 powder which is introduced on the final stage of synthesis of ZnO nanorods, using a low-temperature hydrothermal method . Their surface morphology, size of particles, behaviour of crystallites and optical properties are investigated using techniques of scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDS), X-ray diffraction (XRD) and an optical spectrometer. A presence of ZnO nanorods and a globular structure of TiO_2 are confirmed by the SEM analysis. The EDS spectra and chemical-element mapping reveals a presence of Ti incorporated into a globular surface, along with Zn. The XRD analysis testifies that ZnO doped with TiO_2 has a primary crystallite phase of ZnO . ZnO doped with 10 and 15 mM of TiO_2 shows a stronger and more expressed peak corresponding to (002) and (011) planes, which implies improved crystallinity of ZnO –TiO_2 system. Optical properties of ZnO – TiO_2 are studied by measuring the intensity of halogen-source light transmitted through the fibres . The ZnO & 15 mM TiO_2 fibre sample shows the lowest intensity of the transmitted light due to higher refractive index of a cladding layer coated under condition of high TiO_2 concentration. The increased light leakage in such a fibre can improve sensitivity of a relevant sensor, especially a gas one.

Author keywords

doping; hydrothermal method ; nanorods; titanium dioxide; zinc oxide; ZnO –TiO_2

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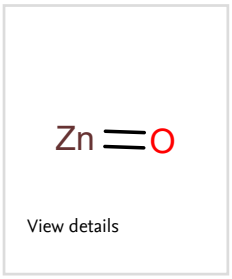

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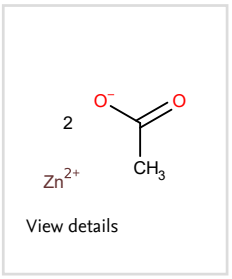

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