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Al-doping Effects on Structural and Optical Properties of Prism-like ZnO Nanorods

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ZnO seed layer were deposited on quartz substrate by sol-gel method and prism-like Al-doped ZnO nanorods (AZO nanorods) were grown on ZnO seed layer by hydrothermal method with various Al concentration ranging from 0 to 2.0 at.%. Structural and optical properties of the AZO nanorods were investigated by field-emission scanning electron microscopy (FE-SEM), X-ray diffraction (XRD), photoluminescence (PL). The diameter of the AZO nanorods was smaller than undoped ZnO nanorods and its diameter of the AZO nanorods decreased with increasing Al concentration. In XRD spectrum, it was observed that stress and full width at half maximum (FWHM) of the AZO nanorods decreased and the 'c' lattice constant increased as the Al concentration increased. From undoped ZnO nanorods, it was observed that the green-red emission peak of deep-level emission (DLE) in PL spectra. However, after Al doping, not only a broad green emission peak but also a blue emission peak of DLE were observed.

Keywords: Zinc oxide, Aluminum, Doping, Hydrothermal