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Induced ferromagnetic and gas sensing properties in ZnO-nanostructures by altering defect concentration of oxygen and zinc vacancies

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Abstract

We report on the effect of the synthesis reaction-time on the structural, optical, magnetic and sensing properties of ZnO-nanostructures. Electron paramagnetic resonance and photoluminescence analyses reveal that singly ionized oxygen vacancies (VþO) and zinc vacancies(VZn) are the main defects and that their relative concentration decreases within creasing particlesizes, resulting in decreased ferromagnet- ism (FM). Moreover, the sensing performance decreased with an increase in nanostructures synthesis reaction-time due to a decreased surface area, as well as VþO and VZn concentrations. Thus, the synthesis reaction-time clearly controls the relative occupancy of the VþO and VZn present on the surface of ZnO- nanostructures, which is enunciated to be critical for enhanced FM and sensing characteristics.