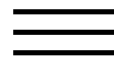


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Microwave power, temperature, atmospheric and light dependence of intrinsic defects in ZnO nanoparticles: A study of electron paramagnetic resonance (EPR) spectroscopy

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## Highlights

- Easy way of synthesizing ZnO nanomaterial.
- Identification of defect centers and detailed analysis of core-shell model.
- Investigating the reactivity of intrinsic defect centers under different conditions.

## Abstract

In this work ZnO nanoparticles were synthesized by coprecipitation method. We investigated the reactivity of 0.24  $\mu\text{m}$  and 50  $\text{nm}$  ZnO sample as bulk and nano-sized, respectively. According to core-shell model we designated the electron paramagnetic resonance (EPR) signal at  $g \approx 2.004$  and  $g \approx 1.961$  as surface defects and core defects, respectively. Dependency of intrinsic defects on the surface and core were investigated under various conditions such as changing of microwave power and temperature, different atmosphere and different light exposures. We found that under such condition core defects revealed more controllable property than the surface defects. Spin-lattice ( $T_1$ ) and spin-spin ( $T_2$ ) relaxation time were also calculated from microwave power dependency measurements and it is found out that both relaxation time lays around nano-second regime which is extremely short. However relaxation time  $T_1$  can be longer under  $\text{N}_2$  atmosphere after further annealing.



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## Keywords

ZnO; EPR spectroscopy; Defects; Size-effects

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