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Effect of Boron doping on the structural, optical and electrical properties of ZNO nanoparticles produced by the Hydrothermal method[1]

OZGUR OZTURK, Kastamonu University, SEVIM DEMIROZU SENOL, CABIR TERZIOGLU, Abant Izzet Baysal University — Effect of boron doping with 0-11 at. % concentration on structural, optical and electrical properties of Zinc oxide nanopowder synthesized by Hydrothermal method has been reported. XRD results reveal that all B doped ZnO nanopowders have single phase hexagonal structure without any impurity. Positions of main diffracted peaks of ZnO shifted slightly towards small 2θ angle and grain size decreases from 60.39 nm to 34.34 nm with an increase of B doping. SEM analyses indicate that the doping concentration of B affected the surface morphology of ZnO nanostructures. Optical properties were examined by UV–Vis absorption/diffuse reflectance spectroscopy. The optical band gap of $Zn_{1-x}B_xO$ nanostructures increased from 3.27 to 3.30 eV with increasing doping from x=0 to x=0.11. The role of B doping on the transport properties was searched by temperature dependent Hall measurements in range of 180–350 K. The carrier concentration of the samples increased from $0.11x10^{14}$ to $4.08x10^{14}$ cm^{-3}, the Hall mobility decreased from 5.61 to $1.22 cm^2V^{-1}s^{-1}$ and electrical resistivity decreased from 10.89×10^4 to 1.25×10^4 ohm-cm with the increase of B doping at room temperature. The electrical resistivity was observed to decrease with both the increase in dopant concentration and the temperature.

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