

## **Low temperature solution synthesis and characterization of ZnO nano-flowers**

### **Abstract**

Synthesis of flower-shaped ZnO nanostructures composed of hexagonal ZnO nanorods was achieved by the solution process using zinc acetate dihydrate and sodium hydroxide at very low temperature of 90 C in 30 min. The individual nanorods are of hexagonal shape with sharp tip, and base diameter of about 300-350 nm. Detailed structural characterizations demonstrate that the synthesized products are single crystalline with the wurtzite hexagonal phase, grown along the [0 0 0 1] direction. The IR spectrum shows the standard peak of zinc oxide at 523 cm<sup>-1</sup>. Raman scattering exhibits a sharp and strong E<sub>2</sub> mode at 437 cm<sup>-1</sup> which further confirms the good crystallinity and wurtzite hexagonal phase of the grown nanostructures. The photoelectron spectroscopic measurement shows the presence of Zn, O, C, zinc acetate and Na. The binding energy ca. 1021.2 eV (Zn 2P<sub>3/2</sub>) and 1044.3 eV (Zn 2p<sub>1/2</sub>), are found very close to the standard bulk ZnO binding energy values. The O 1s peak is found centered at 531.4 eV with a shoulder at 529.8 eV. Room-temperature photoluminescence (PL) demonstrate a strong and dominated peak at 381 nm with a suppressed and broad green emission at 515 nm. suggests that the flower-shaped ZnO nanostructures have good optical properties with very less structural defects.

### **1. Introduction**

Controlled synthesis of semiconductor nanostructures in terms of size and shape has been strongly motivated as the properties can be tailored by shape and size and novel applications can be investigated dependent on their structural properties. Among various semiconductor nanostructures, variety of nanostructures of ZnO has been investigated presenting it as a richest family of nanostructures. With a wurtzite hexagonal phase, ZnO have a direct band gap of 3.37 eV with the larger exciton binding energy (60meV). possesses a wide range of technological applications including transparent conducting electrodes of solar cells, flat panel displays, surface acoustic devices, UV lasers and chemical and biological sensors, Various methods such as thermal evaporation.

