

Photonic Behavior of Nano-Particle ZnO

Y.Y. Tay¹, P. Chen², J. Plevart¹, S.J. Chua², C.C. Wong¹ and S. Li¹

¹ School of Materials Engineering, Nanyang Technological University, Singapore

² Institute of Materials Research and Engineering, Singapore

Recently nano-sized particles have attracted enormous attention due to their unique properties. Here, we report size dependence of photonic properties in ZnO nano particles. In this work, a strong broadening of photoluminescence (PL) emission toward shorter wavelength was observed when the particle size reduced from 175 nm to 8.5 nm while a typical red shifting was discernable with smaller sizes. These imply that there are two different mechanisms of size effects on photonic behaviors in this material. The crystallography modifications of nano-particle ZnO and formation of lattice defects was investigated. It is believed that non-bridging oxygen hole center on the surface of nano-particle ZnO is responsible for the red-shift of the PL spectrum when the size is less than 5 nm.

Keywords: Photoluminescence (PL), Nanoparticles, ZnO, Lattice Defects, Non-Bridging Oxygen Hole Center