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Synthesis and properties of metal doped ZnO nanostructures for devices applications

The effects of substituting Ag3+ into Ag-doped ZnO NR's, $Zn_{1-x}Ag_xO$ (x=0.0, 0.1, 0.2, 0.3, 0.4 and 0.5) are investigated. X-Ray Diffraction (XRD) patterns do not indicate that the Ag ions are systematically replacing the Zn ions but instead are forming into nano Ag particles. Since the radius of the Ag^{3+} ions (0.126 nm) is much greater than that of Zn^{2+} (0.072 nm), there would be a tremendous amount of lattice distortion if at the higher level of Ag doping, the Ag ions replaced the Zn ions at the lattice sites. In the XRD patterns for the pure and x=0.1 NR's, we did not observe any peaks of the FCC crystal structure of Ag. When Ag was increased to x≥0.3, we see the reflection from the Ag (1 1 1) and Ag (2 0 0) planes. SEM shows that the morphologies of NR's are changing along with the shape of the rods as the level of Ag substitute increases. For pure ZnO, the rods are orientated perpendicular to the plane and appear to be hexagonal. The SEM images of the 1% Ag doped ZnO NR's still show the presence of rod shaped particles. The morphologies of the 2% Ag doped ZnO NR's are quite different. Some of them appear in star shape with a few arms emanating from a central point. SEM image of 5% Ag doped NR's showed ZnO NR's appear to be "broccoli" shaped. The results from PL spectrum revealed that the visible light emission of the undoped ZnO NR's are somewhat suppressed but becomes strongly enhanced (in the region between 450–600 nm) as the level of Ag doping is increased to 1%, then to 2%. This could be taken as evidence that more defects were being created as the Ag ions were replacing the Zn in their sites in the wurtzite structure.

Biography

Sirikanjana Thongmee is an Assistant Professor of Physics. She was in Physics Department, Faculty of Science, Kasetsart University. She got her BSc in Physics at Prince of Songkla University, MSc in Chemical Physics at Mahidol University and PhD (Materials Science) at National University of Singapore. She got the Thesis Presentation Award, Mahidol University, Thailand in 1999 and Outstanding Research of the Year - 2nd Class Award, Office of the National Research Council of Thailand in 2003. Currently her research focuses on the metal doped ZnO for spintronics and gas sensors applications, magnetic nanomaterials, graphene oxide for different applications and activated carbon from agricultural waste.

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