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HYDROTHERMAL SYNTHESIS OF ZnO POWDERS WITH A TAILORED PARTICLE MORPHOLOGY AND IMPROUVED OPTICAL CHARACTERISTICS

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ZnO represent one of the most important multifunctional materials. Its properties are well known and confirmed in different application areas such as: gas sensors, UV lasers, solar cells, electroluminescent and optoelectronic devices, piezoelectric transducers, hydrogen-storages, rubber industry and plastic processing, cosmetics and pharmacy, and it is also used as an antibacterial agent. In this work, we propose a low-temperature hydrothermal method for the synthesis of phase-pure ZnO powders with a controlled morphology and narrow particle size distribution. This simple and low-cost method allows tailoring of the shape and size of ZnO particles, from micro-rods *via* hexagonal prism-like to nano-spheres, by choosing the appropriate pH of the reaction solution, tuned by the varying of $[Na^{+}]$:$[Zn^{2+}]$ molar ratio. The agglomeration of the powders was prevented with the assistance of PVP as a capping agent.

The synthesized powders were characterized by XRD, TEM, SEAD and HRTEM methods to examine the phase purity and crystallinity. FE-SEM measurements were used for the morphology characterization, while the results of Raman and UV-Vis DRS measurements were used for the study of optical properties. The relationship between the particle size and morphology and the optical properties is discussed. Diffuse reflectance spectra of ZnO powders with different size and morphology revealed characteristic R curves with the absorption edge near 380 nm, but with obvious difference in the absorption in the visible region. The micro-sized powder ZnO8 revealed the lowest reflectance (~70%), compared to submicro- (~80%) and nano-sized (ZnO12 and ZnO13, ~90%) powders. Thus, the reflectance of the ZnO powders decreases with the increase in the average particle size.