

Effect of Benzo perylene monoimide on optoelectronic properties of Cd-doped ZnO nanostructures

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Abstract

CdZnO nanostructures have sparked worldwide interest because of increased surface to volume ratio which has great effect on material properties leading to its potential applications in nano-scale optoelectronics [1]. It is crucial to obtain highly ordered nanostructures to enhance performance of such devices. Hybrid inorganic/organic nanostructures comprising of layers of benzo perylene monoimide and Cd-doped ZnO called CZO nano hybrids were electrochemically synthesized on Ga-doped ZnO/Si [2]. Inorganic Cd-doped ZnO called CZO nanorods were also synthesized in order to study the effect of the peptide organic surfactant.

FESEM studies in Figure 1 reveals formation of inorganic CZO nanorods and ordered lamellar CZO nano hybrids without and with the use of benzo perylene monoimide, respectively.

Low temperature photoluminescence measurements were performed with the temperature variation from 80 K to 300 K. White emission was seen from both CZO nanorods and nano hybrids at low temperatures while orange emission around 600 nm associated due to peptide was evident in case of nano hybrids. The temperature dependent PL spectra follow characteristic band gap shrinkage according to Varshni relation Figure 2.

Temperature dependent photosensitivity measurements reveal the nano hybrids were highly photosensitive. The nano hybrids were 8x and 4x more photosensitive than nanorods at 80 K and 300 K, respectively. These nano hybrids have potential applications as photodetectors and light-emitters.

References

- [1] J. Z. Liu, P. X. Yan, G. H. Yue, J. B. Chang, R. F. Zhuo, D. M. Qu, *Mat. Lett.* 2006, 60, 3122-3125.
- [2] S. Verma, S. K. Pandey, M. Gupta, S. Mukherjee, *J. Mater. Sci.* 2014, 49, 6917

Figures

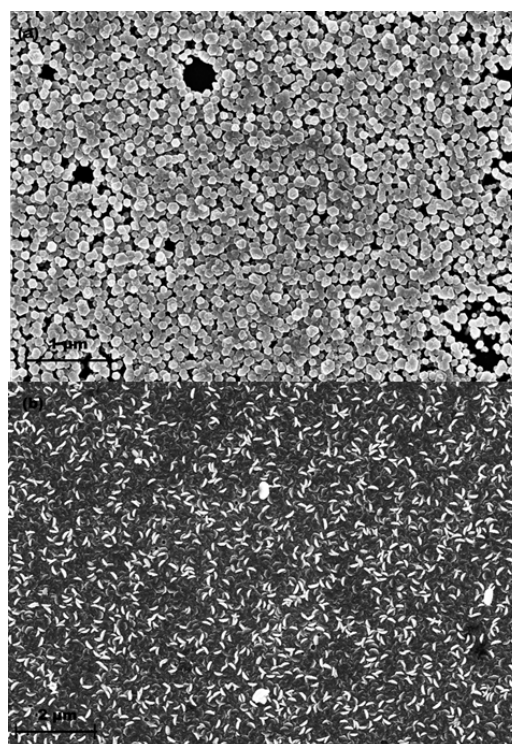


Figure 1. FESEM images of a) CZO nanorods and b) CZO nano hybrids.

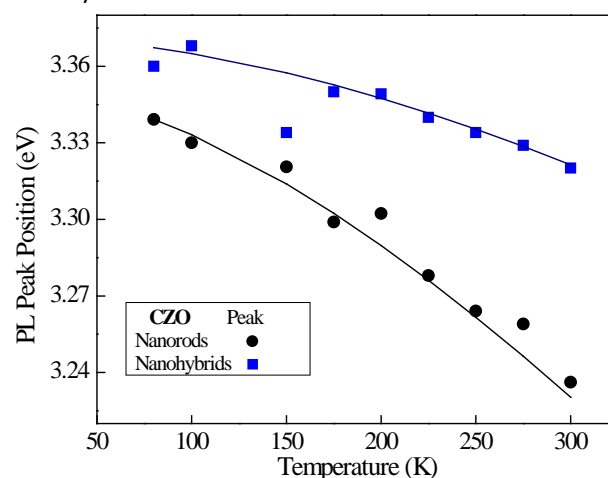


Figure 2. Varshni fitting for CZO nanorods and nano hybrids.