

Development and application of novel photonic materials for sensing applications

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Novel 1-D ZnO nanostructures have been developed and studied for gas and biosensor applications.

Polyacrylonitrile (PAN)-ZnO core-shell nanostructures have been prepared using electrospinning and atomic layer deposition (ALD) technique. The PAN nanowires were coated with ALD-deposited ZnO thin layers with thickness of 30 nm. Gas sensitivity tests of ZnO-PAN (ZnO 30 nm) samples were performed for ethanol detection using photoluminescence (PL) method. The changes of visible and UV emission bands of ZnO, induced by ethanol adsorption, have been observed [1].

ZnO Nanorods (NR) were deposited by gaseous-disperse synthesis [2]. The ZnO NRs were 460 nm in length and 60 nm in diameter. The PL spectra showed strong UV emission and weak visible peak, pointing to good crystallinity of the nanorods [2]. Bioselective layer was formed by immobilizing of specific antibodies on top of ZnO NRs. The obtained biosensor was used for photo luminescent detection of cancer cells (PA-1 line). Deposition of PA-1 cancer cells on the biosensor surface induced a decrease of the PL signal. The developed biosensor was sensitive to cancer cells concentration in the range of 10000-1000000 cells/ml.

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References

1. Roman Viter, et. al., Tuning of ZnO 1D nanostructures by atomic layer deposition and electrospinning for optical gas sensor applications, *Nanotechnology*, 26 (10):105501 (2015)
2. Roman Viter, et. al., Application of Room Temperature Photoluminescence From ZnO Nano-rods for Salmonella Detection, *IEEE Sensors Journal*, 14(6) 2028-2034 (2014)