

# Synthesis and Fabrication of Functionalized Nanostructured CuO Platform for Electrochemical Detection of Cancer Biomarker

Deepika Sandil<sup>1,2</sup>, and Nitin K. Puri<sup>\*1</sup>

<sup>1</sup>Advanced Sensor Laboratory, Department of Applied Physics, Delhi Technological University, Main Bawana road, Delhi-110042, India

<sup>2</sup>Department of Applied Physics, Bhagwan Parshuram Institute of Technology, Delhi 110089, India

\*Corresponding author's email address: nitinkumarpuri@dtu.ac.in

## Abstract

In this work, we report a simple and cost effective large scale synthesis of CuO nanostructures using a wet chemical route. CuO nanorods and flowers of dimension in the range of 15-30 nm were synthesized and was studied using XRD. The surface morphology and composition have been determined by scanning electron microscope (SEM), energy-dispersive X-ray spectroscopy, Fourier transform infrared spectroscopy and transmission electron microscope which show uniform growth and symmetrical structure. The synthesized nanostructures provide large surface area and high adsorption coefficient which can be

utilized for the fabrication of biosensing platform for the electrochemical detection of cancer biomarker carcinoembryonic antigen (CEA). 3-aminopropyl tri-ethoxy saline (APTES) was used for the functionalization of the n-CuO and electrophoretic deposition technique was employed for the deposition of functionalized nanostructures on ITO substrate. The electrochemical sensing studies of the fabricated immunoelectrode were characterized using cyclic voltammetry and electrochemical impedance spectroscopy. The results of these studies demonstrate good sensitivity along with good reproducibility and selectivity.

**Key words:** n-CuO, Cancer biomarker, APTES, Immuno-sensor, Electrochemical sensing

## References:

- [1] Yamamoto, K.; Kasuga, T.; Nogami, M.; *Electrochem. Solid-State Lett.*, 1999, 2, 595-596. DOI: 10.1149/1.1390917
- [2] Chen, Y. J.; Xue, X. Y.; Wang, Y. G.; Wang, T. H.; *Appl. Phys. Lett.*, 2005, 87, 233503. DOI: 10.1063/1.2140091
- [3] Lee, K.; Seo, W.S.; Park, J.T.; *J. Am. Chem. Soc.*, 2003, 125, 3408-3409. DOI: 10.1021/ja034011

- [4] Volanti, D. P.; Felix, A. A.; Orlandi, M. O.; Whitfield, G.; Yang, D.; Longo, E.; Tuller, H. L.; Varela, J.A.; *Adv. Funct. Mater.*, 2013, 23, 1759-1766. DOI: 10.1002/adfm.201202332
- [5] Chand, P.; Gaur, A.; Kumar, A.; *Superlattices Microstruct.*, 2013, 60, 129-138. DOI: 10.1016/j.spmi.2013.04.026
- [6] Mallick, P.; Sahu, S.; *Nanosci. Nanotechnol.*, 2012, 2(3), 71-74. DOI: 10.5923/j.nn.20120203.05