# Fabrication and characterization of nanostructured zinc oxide on printed microcontact electrode for piezoelectric applications


## ABSTRACT

Dynamic integration of aligned nanostructures fabricated on different surfaces has prompted the needs for a novel nanoelectromechanical energy harvester. This study describes the morphologies of as-synthesized zinc oxide (ZnO) nano rod-like structures grown onto a bare sputtered substrate and patterned microcontact electrode (IDE), using a simple chemical bath deposition method (CBD). Local piezoresponse measurements were conducted to detect the piezoelectric response and polarization switching in Zinc oxide nanorods. The morphological characteristics and electromechanical response of the grown nanostructures on the printed electrode have been investigated, as a step towards enhancing the performance of piezoelectric nanogenerators. The growth characteristics and energy harvesting ability of nanostructured ZnO on interdigitated microelectrode (IDE) were reported. AFM analysis indicated that the average seed layer thickness of the ZnO film deposited before the lithographic pattern of the IDE was about ~267.5 nm. The FESEM images and XRD analysis confirmed that the ZnO nanorods possessed a hexagonal wurtzite structure having the c-axis crystal orientation preferentially in the (002) plane. FTIR spectrum confirmed the secondary vibrations of the Zn–O bonding at 669.75 cm−1 even with the adjustment in the microstructural features of ZnO. Finally, the Piezoresponse Force Microscopy (PFM) analysis confirmed the converse piezoelectric response of the grown nanorods.



**Keyword:** ZnO nanorods; Nanostructures; Chemical bath deposition; Piezoelectric response; Interdigitated microelectrodes; Nanogenerators