Piezoelectric properties of zinc oxide nanostructure synthesized via chemical bath solution

ABSTRACT

We report our investigation on the growth of ZnO nanostructure on a patterned interdigitated microelectrode (IDE) using chemical bath deposition (CBD). Piezoresponse force microscopic techniques were used to characterise the piezoelectric material domain of the grown ZnO nanostructures. The synthesised ZnO nanostructures exhibits a hexagonal wurtzite structure with the c-axis preferred crystal orientation in the (002) plane. The average thickness of the ZnO seed layer was 467.5 nm, whereas the diameter and length of ZnO nanostructure were measured to be 2.73 μm and 6.96 μm respectively. The combine effect of Zinc nitrate and HTMA concentration and seed layer thickness are considered as the main reason for crystal morphology evolution. The ZnO nanostructures exhibited a phase switch of the response and hysteresis in the plot of phase versus dc voltage, as evidenced by the polarization exchanging of its ferroelectric behaviour. These results provide a fundamental understanding of piezoresponse ZnO nanostructure for future energy applications.

Keyword: ZnO; Interdigital transducer electrodes (IDE); Chemical bath deposition; Piezoresponse force microscopy