ABSTRACT

The advancement in nano-technology imposed great impact on human life due to its vast variety of applications in various fields like medical and healthcare, sports industry, textile industry, agriculture industry, food industry, cloth industry, electronic devices and energy sector. This advancement is based on development of versatile nano-materials; those have attained gigantic reputation because of its superior properties and applications. By using smart and advanced nano-material, various types of nano-structures like nano-pores membrane/template, nano-particles, nano-wires, nano-rods, nano-tube, nano-fibers can be synthesized by adopting echo friendly strategy. Among these nanostructures, anodized aluminum oxide (AAO) template has vast applications in filtration and purification, micro-electromechanical system (MEMS) deices and for use in a template in electronics devices. In this work, firstly we have studied simulation of mechanical behavior of AAO nano-porous template by performing finite element analysis using ANSYS. The results depicted that the porous template produced maximum deflection of 1.56μm at the middle when a pressure of 5kPais applied. Secondly, AAO templates were fabricated in two step anodization by using self-designed anodization setup. Field emission scanning electron microscopy was performed to investigate the pore size that is in the range of 60, 80 and 100 nm. After successful template/membrane fabrication the chemical bath deposition method were adopted to grow the zinc oxide (ZnO) nano rods on AAO template. These templates can be used to develop MEMS devices. The expedient way for development of micro-electromechanical systems has (MEMS) based devices are in two key steps. First, perform the simulation for optimization of various parameters by using different simulation tools that leads to cost reeducation. Secondly, development of devices with accurate fabrication steps using optimized parameters. Here, authors have performed piezo-electric analysis of array of zinc oxide (ZnO) nano structures that create on both sides of aluminum rods. Various quantities like swerve, stress, strain, electric flux, energy distribution and electric potential have been studied during the piezo analysis. Then actual control growth

of ZnO nanorods (NRs) arrays were grown on both side of etched aluminium at low-temperature using chemical bath deposition (CBD) method for development of MEMS energy harvester. The testing was performed by applying ambient range force on nanostructure and found that the voltage range on topside is 0.59 to 0.62 mV and bottom side 0.52 to 0.55 mV. These kinds of devices are useful in low power control circuits.