

MODELLING AND SIMULATION OF NANOGENERATOR USING VERTICALLY INTEGRATED ZINC OXIDE NANOWIRE ARRAY

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Recent developments in nano-level energy harvesting are mainly focused on using piezoelectric power generators from compression and vibration modes. In this work, a vertically integrated zinc oxide piezoelectric nanowire array was modeled to scavenge energy from low-frequency compression force. COMSOL Multiphysics 5.4 software was used to simulate and model nanowire array structures to ensure the potential distribution and overall electric energy generator of the piezoelectric structure under compression displacement. Piezoelectric constitutive equations were used to develop mathematical equations in terms of comparing and confirming induced piezoelectric outputs. The simulation results confirmed that the voltage output of the nanowire array does not depend on the number of nanowires. Total electric energy harvested by the array depends on the number of nanowires and nanowire density.

Keywords: Zinc Oxide Nanowire, Finite Element Analysis, Piezoelectric Nanogenerator, Nanowire Array.