ABSTRACT

Environment is the natural source of mechanical energy. A lot of mechanical energy is wasted from these natural sources and as well as other synthetic sources. To utilize the useful energy, various techniques have been opted. To remove the wastage of the mechanical energy generated by various natural resources, it is converted to a suitable other form of energy. Converting the mechanical energy into electrical energy is known as energy harvesting. Various types of energy harvesters are reported in literature including electro-static, electro-magnetic and piezo-electric. Among these types piezo-electric energy harvesters are considered an important method to convert ambient mechanical energy including tapping, walking, vibration and any other movement into electrical energy. Micro-scale energy harvester devices are an efficient method to harvest energy from the ambient environment sources. Ambient environment sources have vibrations in the range of 0.1 to 100 Hz which are good mechanical sources of energy. Various piezo-electric materials has been reported in literature to convert energy including PZT, ZnO and lead based materials. Among these materials, ZnO is considered environment friendly and compatible with semiconductor technology. ZnO shows excellent piezo-electric and pyro-electric properties owning to its excellent and unique internal structure. Altering and tailoring the optical and structural properties of ZnO will result in change in the piezo-electric properties. The optical and electrical properties can be tailoring by doping ZnO with other materials. In this work, the simulation, synthesis, characterization and testing of ZnO and G-II doped ZnO are performed for energy harvesting applications. MATLAB fuzzy logic controller provides a way to estimate the effect of material doping on the band-gap and rod diameter. The 2nd group elements doped ZnO effect the rod diameter as well as bang-gap. The prepared AAO template shows a highly porous AAO with pore size of 180.5 nm which is used as a substrate for the growth of nanostructures. The prepared 2nd group element doped ZnO were characterized which shows a decrease in rod diameter with addition of 2nd group element from 192 nm to 167 nm. Band-gap various largely due to addition of conductive material and decrease in rod diameter. These parameters shows the effect on optical and electrical properties of ZnO nanostructure which will eventually result in the change in the energy harvesting properties of Zinc-oxide nano-material.