NW-P001

Synthesis and Characterization of An Omnidirectional ZnO Piezoelectric Nanogenerator

Jun Young Lee, Jong Souk Yeo

School of Integrated Technology, Yonsei Institute of Convergency Technology,
Yonsei University, Incheon, Korea

Piezoelectric energy harvesting (PEH) device refers to a power device for acquiring mechanical energy from the environment surrounding us which would otherwise be wasted and for converting it into usable electrical energy. While much work has been done on developing ZnO nanogenerator (NG) with nanowire arrays, there are some issues of not only scaling up its output power but also optimizing structure for operating feasibly in various conditions. Efficiency of NG is highly dependent on fixed orientation. But in many cases, it is not easy to predict where the pressure and vibration may come from. Furthermore, the direction of the applied mechanical stress is usually non-stationary and can be random in various practical applications. Therefore an omnidirectional PEH is needed.In this work, we investigate an omnidirectional PEH device consisting ZnO nanowires. We deposited spiral patterned ZnO seed layer on Kapton film. We deposited thin Cr layer on the ZnO seed layer using DC-sputter to form a passivation layer to retard un-expected growth of ZnO nanowires. We grew ZnO nanowires along the spiral arms using hydrothermal method. ZnO nanowires have been selectively grown from the ZnO sidewall without Cr layer and have the average length of 5 μm and the average diameter of 40nm. We reduced the defect in the as-grown ZnO nanowires by O2 plasma using asher and by thermal treatment using RTA. Consequently, each nanowire has different directions to each other. This isotropic design can lead to the omnidirectional power generation. The morphology of NG is characterized with FESEM. Maximum output power of the device is measured by using a picoammeter and a nanovoltmeter.

Acknowledgement

Acknowledge that the research is supported by the MKE(The Ministry of Knowledge Economy), Korea, under the "IT Consilience Creative Program" support program supervised by the NIPA (National IT Industry Promotion Agency) (NIPA-2012-H0201-12-1001).

Keywords: Nanogenerator, Piezoelectric, Omnidirectional, ZnO