Polymer Nanogenerator for Energy Scavenging Application

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The rising demand of energy consumption and increasing mobility of electronic devices has been the motivation towards development of new alternate power sources. In the last few years, there has been a surge of researches in the area of power harvesting. The advances have allowed numerous openings for power harvesting system in practical real-world applications. During last three decades, poly-vinylidene fluoride (PVDF) film mainly has been investigated for various applications such as sensors, transducers, etc., due to its piezo- and pyroelectric behavior. It can also be a good candidate for mechanical energy harvesting due to the development of tiny electronic devices consuming ultralow electric power. In this work an electrospinning method has been used to prepare poly(inylidene fluoride-hexafluoropropylene) [P(VDF-HFP): a copolymer of PVDF] nanofiber webs. This simple and scaled-up processing technique has many advantages in generator based applications, because a single-step electrospinning process can eliminate the need for direct-contact or corona poling to induce β-crystal phase and spontaneous dipolar orientation at the same time. P(VDF-HFP) nanofiber webs based generator has been fabricated and it will be very useful device for energy scavenging applications. When the piezo-electric signal generated by the sinusoidal pressure on the top and bottom electrodes of the P(VDF-HFP) nanogenerator is connected to a bridge rectifier circuit, the output piezo-electric signal of the generator was acquired and logged in a PC. Furthermore, it has been found that the output signal can be significantly improved (5 fold) by metal nanoparticle (i.e. silver, gold, palladium) doping in P(VDF-HFP) nanofiber webs. We observed the charging capability of capacitors by imparting periodic pressure and the generating output current solely depends on the layer thickness of the P(VDF-HFP) nanowebs and active pressure imparting area.