

Nanogenerators for Self-powered Devices and Systems

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Ever since the wide range applications of laptop computers and cell phones, seeking of power sources for driving portable electronics is becoming increasingly important. The current technology mainly relies on rechargeable batteries. But for the near future, micro/nano-systems will be widely used in health monitoring, infrastructure and environmental monitoring, internet of things and defense technologies; the traditional batteries may not meet or may not be the choice as power sources for the following reasons. First, with the increasingly shrinkage in size, the size of the total micro/nano-systems could be largely dominated by the size of the battery rather than the devices. Second, the number and density of micro/nano-systems to be used for sensor network could be large, thus, replacing batteries for these mobile devices becoming challenging and even impractical. Lastly, the power needed to drive a micro/nano-system is rather small, in the range of micro- to milli-Watt range. To meet these technological challenges, the author proposed the self-powering nanotechnology in 2005, aiming at harvesting energy from the environment to power the micro/nano-systems based sensor network. Ever since we demonstrated the first *nanogenerators* using piezoelectric nanowires for converting mechanical energy into electricity (Wang & Song, *Science*, 312, 242-246 (2006)), a great interest has been excited worldwide for developing various approaches for energy harvesting. A key idea presented in the 2006 paper is the *self-powered nanotechnology*, aiming at powering nanodevices/nanosystems using the energy harvested from the environment in which the systems are suppose to operate. To provide a comprehensive and coherent review about the development of nanogeneratos, I have organized this book mainly based on our published papers to provide a coherent coverage about the nanogenerators from fundamental materials, basic physics principles and theory, scientific approach, engineering-scale up and technological applications, so that the readers can get a full picture about the development of this technology. The entire book is composed of 11 chapters with hundreds of figures.

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