

# Emerging Trends in Materials Science and Nanotechnology

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## NANOMATERIAL AND NANOSTRUCTURES FOR ENERGY CONTROL AND ENERGY HARVESTING

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**A**mong other features, smart phones and other new electronic objects for internet of things require low consumption and sensing devices, while larger autonomy is a need from the user side. While photovoltaic devices are limited to appropriate outdoor conditions, nanobased thermoelectric and piezoelectric energy harvesters can operate continuously. Efforts are made to increase the figure of merit  $ZT$  of thermoelectric devices together with using environmental safe materials. We present such an alternative, nanocomposite superlattices with SiGe, Ti and Mg silicides materials. Such artificial materials are engineered to enhance their thermoelectric properties when appropriate crystal structure, dimensions and doping levels are chosen.

Another strategy to harvest energy, also taking advantage of the specific nanoscale properties, is the realization of ZnO and GaN nanogenerators. Modeling and electromechanical characterization are realized at the nano and macro scales. Appropriate engineering of the nanogenerators can lead to large performances. Nanoswitches can be used to control energy of part of the IC circuit. Nanostructured devices are also presented for low energy sensing application. Several prototypes and applications are shown to demonstrate their potential for future applications.

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