MATERIALS SCIENCE AND ENGINEERING

SEMINAR

"Piezoelectric ZnO Nanowires for use in Energy Harvesting Applications"

by

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ABSTRACT

Biosensors that can provide real-time detection in vivo are currently being intensely studied. In order to be able to implant sensors, a biologically safe and relatively small power supply is necessary. Batteries have finite lifetimes and are generally not biocompatible and external power sources limit the use of sensors. However, a nanogenerator that harvests energy from the environment would be a safe and practical alternative by converting mechanical energy (from body motion or muscle stretching), vibrational energy (from acoustic or ultrasonic waves), or hydraulic energy (from body fluid or blood flow) into electrical energy. Vertically aligned ZnO nanowire arrays have been suggested to be a possible system for biocompatible nanogenerators.
A ZnO nanowire array is a novel approach for converting nanoscale mechanical energy into electrical energy. The functionality relies on the bending of the nanowires by an external disturbance that creates a piezoelectric potential. Vertically aligned ZnO nanowires can produce a DC signal, creating a system with no need for rectifiers and could potentially be wired directly into a nanodevice, greatly decreasing the size of the sensor. In order for this to be a viable power source, the efficiency of the generator must be high enough to ensure that sufficient power is produced for the biosensor to function without the system being too large to be implanted. However, there are discrepancies as to whether the ZnO nanogenerators perform as reported in the literature. This review will focus on the charge generation process and discuss the shortcomings of the suggested mechanisms. In order to determine the feasibility of ZnO nanogenerators, alternative experiments are proposed.

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