Seminar at the Technical Research Center, IACS

Speaker: Dr. Sohini Kar-Narayan
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Title: Polymer-based nanomaterials for energy harvesting applications

Date & Time: Monday, April 10th 2017 at 11.30 AM

Venue: CV Raman Hall, IACS

TITLE: Polymer-based nanomaterials for energy harvesting applications

Harvesting energy from ambient mechanical sources in our environment has generated tremendous interest as it offers a fundamental energy solution for 'small power' applications, including but not limited to wireless sensors. In this context, piezoelectric and/or triboelectric materials offer the simplest means of directly converting mechanical vibrations, from sources such as moving parts of machines, fluid flow and even body movements, into electrical power for microscale device applications. In particular, nanoscale energy harvesters, or nanogenerators, are capable of converting low-level ambient vibrations into electrical energy, thus paving the way for the realisation of the next generation of self-powered devices.

Polymer-based nanogenerators are attractive as they are inherently flexible and robust making them less prone to mechanical failure which is a key requirement for vibrational energy harvesters. They are also lightweight, easy and cheap to fabricate, lead free and biocompatible, but their energy harvesting performance is often found lacking in comparison to more commonly studied inorganic materials. Our group thus develops scalable nanofabrication techniques for flexible and low-cost polymer-based nanogenerators with improved energy conversion efficiency, by using template-assisted nanowire growth techniques. In this talk, I will discuss our recent advances in incorporating nanowires of ferroelectric polymers such as P(VDF-TrFE) and Nylon-11 into scalable piezoelectric and triboelectric nanogenerators, as well as the design and performance of polymer-ceramic nanocomposite nanogenerators. In particular, I will also focus on advanced and novel scanning probe microscopy methods that we use for the characterization of these polymeric nanomaterials and the extraction of relevant materials properties for nanogenerator design.

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