School of Materials Science and Engineering

Seminar Topic:
Novel Biocomposites Comprised of Proteins for Biomedical and Optoelectronic Applications

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Abstract

Proteins form the very basis of life. They regulate a variety of activities in all known organisms, from replication of the genetic code to transporting oxygen, and are responsible for regulating the cellular machinery and determining the phenotype of an organism. From a material-science point of view, proteins can serve as excellent building blocks for the development of new structures, composites, and devices.

In this talk, I will cover some of our efforts in this direction. In all of the examples described the mechanism of formation of the composites includes introduction or synthesis of nanostructures within hydrophobic voids of glycoproteins. Examples covered in this talk include:

(I) A stable biofilm that can be used for White LED applications. This bio-composite material, entirely composed of biological- (crystalline nano-cellulose and porcine gastric mucin) and organic- (light emitting dyes) compounds exhibits excellent optical and mechanical properties as well as resistance to heat, humidity, and UV radiation.

(II) A protein templated synthesis is used to incorporate various types of metals and alloys in the protein matrix. Examples include Chiral Ag nanoparticles, Pd and Pd-Ag alloys and Au nanoparticles and micro-crystals. The latter is successfully used as a local heat source used in a light-induced thermotherapeutic applications.

Biography

Prof Shachar Richter obtained his PhD in Materials Science and Chemical Physics from Weizmann Institute of Science, Israel. He is the Head of the Bio-and molecular electronics Lab and Faculty Member at the Department of Materials Science and Engineering at Tel Aviv University, Israel. After graduation, Prof Richter joined Bell-Laboratories and Agere Systems (NJ, USA) as a post-doctorate fellow and later appointed as an independent staff member (MTS). In 2001 he joined Tel-Aviv University where he established the Nano-Electronics lab at the Center for Nanoscience and Nanotechnology where he serves as a Core Member. In 2003 he joined as a Faculty Member at the School of Chemistry. He then moved to the Department of Materials Science and Engineering where he is the co-founder of the Department of Material Science and Engineering heading the Bio-and Molecular Electronics group in 2013. He has co-authored more than 70 peer-reviewed papers and patents in leading journals and won several prizes. Prof Richter held several public roles including heading the Materials Science and Engineering and the Nanotechnology MSc program, serving as the President of the Israel Vacuum Society as well as Editorial Board members of several journals. Some of his patents were licensed to companies and in the process of commercialization. Prof Richter will be heading the Tel-Aviv Wolfson Applied Materials Research Centre from December 2019.

His current research interests are jellyfish-based composites, molecular- and bio-electronics, bio-nanocomposites and novel patterning technologies.

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Hosted by: Prof Lam Yeng Ming