

From (Bio) Organic Materials to Electronic and Photonic Devices

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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 short, we exploit the hydrophobic voids and the reduction properties of some glycoproteins to form new biocomposites materials.

Recently we demonstrated a stable film 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. We further show that a protein templated synthesis can be 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

Short Biography

Prof. Shachar Richter (Ph.D. material Science and Chemical Physics, Weizmann Institute of Science, Israel) 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. Prof. Richter was a post-doctorate fellow and independent staff member (MTS) at Bell-Laboratories and Agere Systems (NJ, USA). 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. He was a faculty member at the School of Chemistry, and from 2013 he moved to the Department of Materials Science and Engineering. His current research interests are molecular- and bio-electronics, bio-nanocomposites, and novel patterning technologies. Recently one of his patents (vertical molecular transistor) was sold to a large company. Among his previous and current public roles, are the heading of the departments' MSc Programs, serving as the president of the Israel Vacuum Society, and member of the NGO "EREZ rescue and search." Prof. Richter in the editorial board of *Scientific reports* Journal and the advisory board member of *Advanced Sustainable Systems*. He has authored more than 70 papers and patents and won several prizes including several "excellence in teaching awards" and IVS honorary member award.

