Seminar @ Materials Engineering Department

Thursday, June 18th , 2026, 11:00-12:00 | *Hall 015, Building 51 (Marcus Campus)*

Electroconductive Nanostructured Scaffold for Fabrication of Smart Skin Graft

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Abstract

Severe burn injuries and chronic wounds present major clinical challenges that demand advanced materials solutions. Current skin substitutes are either mechanically fragile, biologically inadequate, or incapable of monitoring the healing process beneath wound dressings. This research focuses on the design and fabrication of electroconductive nanostructured scaffolds that integrate regenerative and sensing functionalities, introducing a new class of smart skin grafts. We first established the molecular principles of peptide-based self-assembly using fluorinated Fmoc-phenylalanine derivatives, revealing how atomic-scale substitutions govern self-assembly pathways, nanostructure morphology, and mechanical properties. These insights guided the development of multicomponent peptide-MXene hydrogels with tunable conductivity, improved oxidation stability, and piezoresistive behavior suitable for bioelectronic interfaces. Translating these molecular insights into a clinically relevant platform, we engineered electrospun polycaprolactone (PCL) fibers functionalized with bioactive Fmoc-FRGD peptides, which promoted dermal-epidermal organization *in vitro* and drove full-thickness skin regeneration *in vivo*. Finally, integration of $Ti_3C_2T_X$ MXene electrodes within the PCL-peptide matrix enabled impedance-based, label-free monitoring of cell adhesion and growth. Together, this work establishes a unified design strategy that links atomic-scale chemistry to wearable bioelectronic function, defining a new class of electroactive biomaterials that both regenerate tissue and report on it in real time. Building on this foundation, my independent research program will extend these principles toward closed-loop, sensing-and-actuating implants for personalized regenerative medicine.

Dr. Dana Cohen-Gerassi received her PhD in Materials Science and Engineering from Tel Aviv University under the supervision of Prof. Lihi Adler-Abramovich and Prof. Yosi Shacham-Diamand. She earned both her BSc and MSc *Summa cum laude*, graduating at the top of her class. Her research focuses on the design and fabrication of bio-inspired electroactive materials for regenerative bioelectronics, smart skin grafts, and real-time physiological sensing. She has authored 16 peer-reviewed publications, including first-author papers featured on the covers of *Advanced Functional Materials*, *Advanced Healthcare Materials*, and *Chemistry of Materials*. Dr. Cohen-Gerassi is the recipient of multiple awards for excellence in research and scientific presentation, including the *2024 MRS Outstanding Doctoral Student Award*, the *Rothschild Postdoctoral Fellowship*, and the *Tel Aviv University Presidential Postdoctoral Fellowship*. In 2026, she will join the laboratory of Prof. John A. Rogers at Northwestern University as a postdoctoral fellow.