הטכניון - מכון טכנולוגי לישראל

TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY

הפקולטה להנדסה כימית
ע"ש וולפסון
The Wolfson Department of Chemical Engineering

Wolfson Department of Chemical Engineering Special Seminar

Lecture Hall 6, Wolfson Department of Chemical Engineering,

Wednesday July 5th at 1:30pm

Muhammad Khatib

PhD student (advisor: Prof. Hossam Haick)
Chemical Engineering, Technion

Fully Self-Healable and Stretchable Chemical Sensors for Wearable Diagnostic Devices

Organic field-effect transistor (FET) based chemical sensors offer considerable advantages over competing strategies, such as electrochemical sensors or chemiresistors. Present FET-based sensors are mostly rigid or flexible making them less convenient for wearable and soft applications. Even flexible sensors are highly susceptible to scratching, rupture, or other mechanical damages from bending or stretching due to their soft nature, leading to loss of functionality. Therefore, self-healing capability, which is a vital function of the human skin, is highly desirable for such electronic devices. In this research, we have introduced the development, fabrication and characterization of a stretchable and fully self-healable FET that recovers its electronic and structural properties under several cycles of cutting and healing. This new innovative device has a stable performance under 50% strains, and shows a good response to temperature and a wide variety of volatile organic compounds (VOCs). Combining all these properties, the reported device shall be a great fit for developing new self-sustainable wearable technologies and clinical diagnostic applications. Based on the detection of VOCs released from human skin, these wearable devices will enable daily health monitoring, early detection of diseases and efficient treatment while being non-invasive cheap, and faster than conventional methods.

Jasmine Rosen

Ph.D. student (advisors: Prof. M. Narkis, Prof. Y. Cohen, Prof. R. Semiat)
The Interdepartmental Program in Polymer Engineering, Technion

Controlled Migration of Antifog Additives from Thin Polyolefin Films

In order to change and/or improve different properties, additives are incorporated into polymeric systems. When added to a polyethylene film, the additives migrate to the films' surface and their concentration decreases; over time the additive's effect desists. Extended performance is necessary to avoid frequent substitution of polyethylene films for different applications (e.g. greenhouses plastic coverings, food packaging) resulting in reduction of plastic waste and contribution to environmental sustainability. In this study, different polymer nano-composites were fabricated by organic (antifog) modification of nano-particles and incorporating them in linear low density polyethylene matrix. The modified nano-particles serve as an additive with different functionalities: a) reduction in fog-formation by water condensation on the film surface ("antifog"); this is achieved using silica nano-particles; b) combination of antifog and UV absorption properties is achieved using titania nano-particles; c) combination of antifog, UV absorption, and antimicrobial properties is achieved using zinc-oxide nano-particles. The modification reaction, the modified nano-particles, and the composite systems were analyzed, studied, and scaled-up.

Refreshments will be served at 1:15pm