Ben-Gurion University of the Negev

אוניברסיטת בן גוריון בנגב

Departmental Seminar

Department of Chemistry

Monday, June 12th, 2023

Time: 14:30

Bldg. 43 Room 015

Prof. Malachi Noked

Chemistry Department, Bar Ilan Institute for Nanotechnology and Advanced Materials (BINA), Bar Ilan University, Israel

E-mail: Malachi.Noked@biu.ac.il

Suppression of Electrode Material Degradation by Using Surface Modifications Techniques

Powering most currently used portable devices, batteries ushered electronics into a new era of mobile energy, directly supporting and influencing our daily lives. However, the ever-increasing demand for energy storage devices with improved performances and is challenging the scientific community to develop new chemistries and morphologies of electrode materials (EM) to move beyond current technology toward electrochemical storage devices with higher energy density, superior power performance and significantly extended stability.

Understanding fundamental degradation mechanisms of EMs, and their mitigation strategies, are challenged by constraints of the liquid electrolyte environment and the complexity of electrode/electrolyte interphase formation, namely the solid electrolyte interphase (SEI) layer which forms, grows, and changes (on the electrode interface) with battery usage. Accordingly, the research community is increasingly seeking new pathways to understand and control battery degradation, including new diagnostic and characterization methods as well as mitigation strategies (e.g., electrode surface treatments, electrolyte additives and artificial SEI layers).

In my talk I will demonstrate how surface modification of EMs, significantly suppress the degradation of the battery components (e.g. electrodes, and electrolyte) and facilitates long-term stability of the electrochemical device.
I will demonstrate how in our lab, we modify the surface of the EMs by either thin protection layer applied on its interface (using atomic/molecular layer deposition- M/ALD), or by surface reduction of high voltage cathode materials. I will farther show how we monitor In-Operando the degradation of the electrode\electrolyte interface using online electrochemical mass spectroscopy (OEMS), and will demonstrate the efficacy of our coating strategy in suppressing the degradation pathway of the Ems.