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|  |  | 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 Seminar**

**Monday, July 29th, 2024, at 13:30**

**Room 4**

**Modifying the Properties and Performance of Degradable Polymers**

**using Atomic Layer Deposition Processes**

**Gil Menasherov**

**MSc Seminar**

Advisor: Prof. Tamar Segal-Peretz

Department of Chemical Engineering, Technion-Israel Institute for Technology

Degradable polymers offer a viable solution to the harmful environmental impact of conventional, non-degradable plastics. However, their widespread adoption is impeded by their lower performance compared to conventional polymers. Degradable polymers are often sensitive to elevated temperatures, UV radiation, and exposure to solvents, as well as having poor mechanical properties and high oxygen and water permeability. One potential avenue for overcoming these challenges lies in the development of organic-inorganic hybrid materials. Vapor phase processes, such as sequential infiltration synthesis (SIS) - a method derived from atomic layer deposition (ALD), have emerged as a promising technique for synthesizing hybrid materials. In SIS, polymers are exposed to gaseous organometallic precursors that diffuse and interact with the polymers, leading to growth of inorganic materials within the polymer matrix.

In this research ZnO and AlOx were used to modified degradable polymers, including poly(lactic acid) (PLA) and poly(hydroxyalkanoates) (PHA), using SIS and ALD to create hybrid materials with enhanced properties, such as enhanced resistance to UV radiation and improved resistance to solvent vapors. We explored the precursor-polymer interactions using in-situ quartz crystal microbalance (QCM) microgravimetric measurements and scanning electron microscopy (SEM). The hybrid materials demonstrated enhanced properties compared to the pristine polymers, as confirmed by thickness measurements and Fourier-transform infrared spectroscopy (FTIR) analysis.

**Refreshments will be served at 13:15**