הפקולטה למדע והנדסה של חומרים
Department of Materials Science & Engineering
הטכניון
מכון טכנולוגי לישראל

SEMINAR סמינר

Renewable-resource-based, Emulsion-templated, Porous Poly(urethane urea)s

Liraz Avraham
Department of Materials Science and Engineering
Technion – Israel Institute of Technology

PolyHIPEs are highly porous, emulsion-templated polymer monoliths typically synthesized via free radical polymerization within high internal phase emulsions (HIPEs), emulsions containing more than 74 vol % internal phase. The advantages of polyHIPEs include high porosities, low densities, and the ability to absorb relatively large amounts of liquids. Recent work has demonstrated that poly(urethane urea) (PUU) polyHIPEs can be synthesized through step-growth polymerization (SGP) within water-in-oil HIPEs. It might also be possible to generate PUU polyHIPEs through interfacial SGP within oil-in-water (o/w) HIPEs. Moreover, it might be possible to incorporate renewable resource polymers (RRPs), e.g. polysaccharides, into such polyHIPEs by adding them to the external, aqueous phase. Polysaccharide-containing porous polyHIPEs might be of interest for tissue engineering (TE) applications.

The objectives of this research were to synthesize RRP-containing PUU polyHIPEs, to characterize their porous structures and properties, and to evaluate their potential for TE applications. The RRP-containing polyHIPEs were synthesized through interfacial SGP within o/w HIPEs containing a polysaccharide (chitosan, pectin, dextran or alginate) or a polyphenol (tannic acid (TA)) in the external, aqueous phase and hexamethylene diisocyanate (HDI) in the internal, organic phase. The polyHIPE porous structures and the mechanical properties were characterized and their potential as TE scaffolds was evaluated through cell growth.

The nature of the polysaccharide, including its ability to act as a co-surfactant, the HDI content, and the catalyst all had significant effects upon the polyHIPE porous structures and properties. While the chitosan- and alginate-containing polyHIPEs tended to exhibit open-cell structures, the dextran- and pectin-containing polyHIPEs tended to exhibit capsule-like structures. The tendency to form open-cell structures was enhanced by using polysaccharides that act as co-surfactants and by using lower HDI contents. The densities and stresses at 70 % strain of the open-cell polyHIPEs (~0.06 g/cc and ~0.18 MPa, respectively) were significantly lower than those of the capsule-like polyHIPEs (~0.15 g/cc and ~2.0 MPa, respectively). Unexpectedly, the TA-based polyHIPE exhibited the best potential for TE applications.

Supervisor: Prof. Michael S. Silverstein

ההרצאה תתקיים ביום ראשון, ה- 26 ביוני 2016 בשעה 14:30
באודיטוריום ע"ש דיוויד וואנג, קומה 3, בנין דליה מידן

The lecture will take place on Sunday, June 26th, 2016 at 14:30,
David Wang Auditorium, 3rd floor Dalia Maydan Bldg.

כיבוד קל יוגש לאחר הסמינר