MSE SEMINAR

April 6, 2018
113 McBryde Hall
3:30 – 4:30 PM
Refreshments at 3:00 PM

Zahra Gallagher

Graduate Student
Materials Science and Engineering, Virginia Tech

"Synthesizing a Heparin Mimic Material Derived from Cellulose Nanocrystals"

Abstract

To prevent clotting during dialysis, heparin is used to line the tubing which blood flows through. Unfortunately, many side effects arise from taking heparin, especially when it's used for an extended period of time. As such, long term exposure for individuals undergoing dialysis every day is unavoidable. To prevent the solubilized heparin from entering the bloodstream, we are investigating a material, instead of a small molecule, to reduce coagulation and long-term effects of heparin. Cellulose nanocrystals (CNCs) contain the same backbone structure as heparin along with desirable mechanical properties, like high stiffness and anisotropic shape. By utilizing the highly reactive hydroxyl groups on CNCs the surface functionalization can be altered to closely mirror that of heparin's binding motif. This motif contains sulfate, carboxyl, and sulfated amine groups. By mimicking this functionalization it should be possible to make a material that counteracts blood clotting, while not introducing soluble small molecule anti-coagulants into the body. Through blood assays and platelet fixing analysis we have been able to show that this change in functionalization does reduce coagulation. We will show that by utilizing CNCs reactive functional groups and incredible mechanical properties we are able to create a material that reduces clotting while maintaining the tubing's mechanical strength, all while eliminating all heparin induced side effects.

Biosketch

Zahra Gallagher is a master's student in Dr. Foster's research group. She graduated from Virginia Tech in 2017 with Bachelors in Biochemistry and Chemistry. Her research focuses have been in drug release using bio-inspired materials and synthesizing blood anticoagulant materials. Zahra also teaches BodyPump for Virginia Tech Recreational Sports. The work of this presentation has been done in collaboration with Dr. Ayres, in the Chemistry department at the University of Cincinnati.