

JOINT MRSEC & MATERIALS SEMINAR

Joint Seminar with
Materials Research & Science Engineering Dept.

Date: Monday, April 13

Time: 3:30 pm, 1315 Chemistry

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“Sugar-coated polymer synthesis: From sustainable materials to selective drug delivery”

The increased demand and environmental impact of petroleum-based chemical feedstocks have spurred a large research push in the area of renewably sourced polymers. Bio-based feedstocks such as carbohydrates offer great promise for materials development due to their rich functionality (high heteroatom content and stereochemistry) and renewable production on a large scale. In addition, carbohydrates offer unique properties that are of high interest for biological applications such as the development of selective drug and nucleic acid delivery vehicles. Herein, we present the design and development of a variety of materials derived from carbohydrates and their application in the development of sustainable plastics, drug delivery, and vehicles for genetic modification. For example, new dimethacrylate monomers and polymers have been synthesized from glucarodilactone and mannarodilactone (derived from glucose and mannose) that form highly cross-linked thermoset materials with mechanical properties comparable to those reported for commercially available stiff poly (dimethacrylates). In addition, several glycopolycation drug and nucleic acid vehicles have been synthesized that vary in carbohydrate type and cationic functionality. For example, we have shown that polymer structure impacts the ability of the vehicle to bind and compact nucleic acids (siRNA, ODNs, and pDNA) into polyplexes. Extensive biological studies have been performed on various polymer structures to understand their *in vitro* and *in vivo* performance; cellular and *in vivo* delivery efficiency and toxicity is highly affected by polymer structure .

