Polymer Program

INSTITUTE OF MATERIALS SCIENCE

Webinar: 11:10 am Friday, January 27

Link: https://uconn-edu.zoom.us/j/95151824839?pwd=bU1OWnpCc1BFM2t3VUZaVzJhdWxqQT09

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Biodegradable polyurethane and polyanhydride polymers for transient electronics

Abstract: Biodegradable implantable medical devices can be employed in versatile clinical scenarios that burden patients with complications and surgical removal of conventional devices. For long-term operation, it still needs to improve its mechanical properties within the very limited selection of biodegradable materials. Recent advances in polymer science overcome the challenges of biodegradable electronic devices by realizing operational lifetimes that match clinical needs. It involves a bioresorbable dynamic covalent polymer that facilitates tight bonding to itself and other surfaces, to serve as a soft, elastic substrate and encapsulation coating for advanced, wireless electronic components. We describe the underlying features and chemical design considerations for this polymer, and the biocompatibility of the constituent materials and their ability to provide a stable, long-lived operation demonstrates the potential for maintaining muscle receptivity and enhancing functional recoveries.

In addition, I would like to introduce polyanhydride-based polymers which serve as hydrophobic encapsulation layers for biodegradable electronics. Systematic experimental studies that involve immersion in phosphate-buffered saline solution at various pH values and/or temperatures demonstrate that dissolution occurs through a surface erosion mechanism, with very little swelling. The mechanical properties of this polymer are well suited for use in soft, flexible devices, where integration can occur through a mold -based photopolymerization technique. Simple demonstrations illustrate the ability to sustain the operation of underlying biodegradable electronic systems for durations between a few hours to a week during complete immersion in aqueous solutions that approximate physiological conditions. Systematic chemical, physical, and in vivo biological studies in animal models reveal no signs of toxicity or other adverse biological responses.