

Polymer Seminar

11:00 am, May 14, 2025

Pratt & Whit. Engr Building, room 476

Host: Thanh Nguyen



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Smart Wearable Healthcare Materials and Devices for Theranostic Applications

Abstract: Diagnostic and therapeutic devices have been routinely used in the clinic as wall-plugged in the hard packages or placed at patients' bedsides. However, with the recent progress of nanobiotechnology, a variety of wearable healthcare devices have been investigated for theranostic applications with greatly improved patients' compliance. Here, we developed smart contact lenses and smart wearable devices for both continuous diabetic monitoring and diabetic retinopathy therapy. Smart contact lens could measure tear glucose levels as a non-invasive alternative to the conventional blood glucose tests and deliver drugs from gold coated reservoirs for the treatment of diabetic retinopathy. On the basis of these results, we also developed a smart wearable device for highly sensitive glucose monitoring in sweat for clinically feasible diabetic diagnosis. A blue-tooth system could send data wirelessly allowing patients to check their diabetic diagnosis results on the mobile phones. Furthermore, we developed cell-integrated poly(ethylene glycol) hydrogels for in vivo optogenetic sensing and therapy. The real-time optical readout of encapsulated heat-shock-protein-coupled fluorescent reporter cells made it possible to measure the nanotoxicity of cadmium-based quantum dots in vivo. Using optogenetic cells producing glucagon-like peptide-1, we performed light-controlled therapy and obtained improved glucose homeostasis in diabetic model mice. Taken together, we successfully developed smart wearable devices for optogenetic cellular engineering for diagnostic and therapeutic applications. This presentation will provide the current state-of-the-art smart wearable devices for further clinical applications.

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