Polymer Micro- and Nanospheres as Optical Glucose Biosensors

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Diabetes mellitus is a disease that inflicts an estimate 100 million people worldwide. Current commercial methods of blood glucose measurement require a blood sample, which is uncomfortable and opens the body to infection. Thus, a noninvasive monitoring approach could lead to better compliance and reduce the risk of infection. Glucose detection based upon fluorescence is one of the promising techniques because of its high sensitivity without interference from other constituents frequently found in blood plasma. Here, we describe the fabrication and characterization of poly(ethylene glycol) (PEG) hydrogel spheres containing chemically immobilized fluorophore-labeled Con A and dextran for potential use as optical glucose sensors. Fluorophore-labeled Con A and dextran were encapsulated in the PEG hydrogel spheres by reverse emulsion photopolymerization, yielding spheres from 500 nm to 20 μm. After sphere fabrication, the presence and leaching of Con A and dextran in the spheres was investigated. The fluorescence emission response of the PEG hydrogel spheres was also determined.