Single-Walled Carbon Nanotube-Based Near-Infrared Optical Glucose Sensors toward In Vivo Continuous Glucose Monitoring

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Abstract

This article reviews research efforts on developing single-walled carbon nanotube (SWNT)-based near-infrared (NIR) optical glucose sensors toward long-term in vivo continuous glucose monitoring (CGM). We first discuss the unique optical properties of SWNTs and compare SWNTs with traditional organic and nanoparticle fluorophores regarding in vivo glucose-sensing applications. We then present our development of SWNT-based glucose sensors that use glucose-binding proteins and boronic acids as a high-affinity molecular receptor for glucose and transduce binding events on the receptors to modulate SWNT fluorescence. Finally, we discuss opportunities and challenges in translating the emerging technology of SWNT-based NIR optical glucose sensors into in vivo CGM for practical clinical use.