FRET-based Capsule Sensors for Glucose Detection

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Fluorescence microcapsules for sensing glucose are described that are based on Förster resonance energy transfer (FRET) of tetramethylrhodamine isothiocyanate concanavalin A (TRITC-Con A) and fluorescein isothiocyanate dextran (FITC-dextran). Con A is able to bind with both glucose and dextran because of good affinity with α-D-glucosyl groups. In case of low glucose concentration, the intensity of FITC fluorescence decreased since TRITC-Con A bound with FITC-dextran. When the glucose level increased, TRITC-Con A bound with glucose rather than FITC-dextran resulting in decrease of FRET opportunity so that quenched FITC fluorescence were recovered. To synthesize capsule sensors, water-in-oil-in-water-in-oil (W/O/W/O) triple emulsion was generated by using glass capillary microfluidic device. TRITC-Con A and FITC-dextran were contained in innermost water phase and PEGDA in middle water phase was photopolymerized with UV light to form solid shell. Glucose sensing with synthesized microcapsules was carried out using dark field spectroscopy. The increase of FITC fluorescence intensity was measured within 0-20 mM (0-360 mg/dL) glucose concentration range.