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ALGINATE/CUCURBIT[7]URIL/DEQUALINIUM–BASED SUPRAMOLECULAR CARBOHYDRATES: MODULATION OF FRET SIGNALS BY TEMPERATURE CONTROL

By

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Abstract

Herein, we describe the synthesis of a bioactive, inexpensive, and easy-to-handle supramolecular carbohydrate polymer by grafting of cucurbit[7]uril macrocycle (CB7)-encapsulated dequalinium chloride hydrate (DCH) onto alginic acid carbohydrates (ALG) via amide linkage formation and show that light energy transfer based on energy migration can be controlled by altering polymer temperature without changing polymer composition. DCH (donor) and 2-anilinonaphthalene-6-sulfonic acid (acceptor) were used to generate Förster resonance energy transfer (FRET) signals. Stationary and time-resolved photoluminescence spectra of the modified carbohydrate platform revealed that FRET resulted in a color change from violet (~387 nm) to blue (~429 nm), which could be repeatedly switched on and off in response to temperature stimuli at 298–368 K. NMR measurements suggested that the responsiveness of DCH/CB7ALG to thermal stimuli was due to the threading of CB7 onto the DCH backbone in solution and upon grafting onto ALG polymers.

Keywords: Energy transfer; Cucurbiturils; Alginates; Dequalinium, Molecular Shuttling; Stimuli-Responsiveness; Temperature control, Luminescence, Time-resolved photoluminescence.