Two-Component Fluorescent Sensing of Saccharides

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Abstract

Boronic acid (BA) derivatives are capable of strong, but reversible interactions with diol-containing compounds like sugars, due to the Lewis acidic properties of the BA moiety[1]. Incorporation of a BA component into charged molecules, can be used to induce quenching in the emission of a fluorescent molecule, thereby creating a two-component sensing system[2]. The change in fluorescent intensity of the system is achieved *via* the formation of a ground-state complex, through electrostatic interactions between the fluorophore and BA-quencher. In the presence of saccharides, the formation of a boronate diester results in the dissociation of BA-quencher and fluorophore ground-state complex and leads to a sequential recovery of fluorescence[2].

In this work, the synthesis of a novel BA-quencher is presented, which contains a positively charged N atom, to promote the electrostatic interactions with the fluorophore, 7-hydroxycoumarin (7HC). As expected, photophysical characterisation shows that upon increased BA-quencher concentrations an extremely efficient and sequential decrease in the fluorescence intensity is observed. The introduction of glucose to this two-component system allows for a recovery in fluorescence and can be used to indirectly quantify glucose concentrations. In addition, the inclusion of anchoring moieties to the BA-quencher shows wonderful potential for the incorporation of these molecules into porous hydrogel platforms. To conclude, this glucose-sensing switch shows a high sensitivity for sugar detection, where on incremental additions of glucose, an increase in fluorescence can be observed.

References

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