Recognition of Molecules and Ions Using Fluorescent Supramolecular Probes

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Development of fluorescent receptors defined as chemosensors exhibiting high selectivity and efficient signal transduction ability has shed a light on exploring functions of living systems. Enormous efforts made by many researchers have successfully produced excellent artificial chemosensors towards metal cations such as Ca^{2+} and Zn^{2+}. However, tedious synthetic tasks as well as required sophisticated molecular designs may inhibit further developments of single-molecule-based chemosensors. To overcome these drawbacks, we have planned to use supramolecular approaches for constructing chemosensors. It is expectedly easy for each component of supramolecules to give not only molecular and ion recognition functionalities but also environmentally responsible fluorescent functionalities. In addition, flexibility on combination of supramolecule constituents may give a large family of chemosensors towards diverse target analytes with simple and similar designs.

Our supramolecular approaches for obtaining chemosensors working in aqueous media utilize spontaneous formation of host-guest complexes of cyclodextrins (CDs) wtih functional guests. Molecular and ion recognition and fluorescent functionalities are provided into either CDs or guests, and thus the resulting host-guest complexes serve as fluorescent supramolecular chemosensors. We have selected inorganic anions, alkali metal cations, and saccharides as primary target analytes. The detection of these molecules and ions are current interests for molecular and ion recognition chemistry, because it is difficult to detect them in aqueous media because of their highly hydrophilic nature. At this symposium, we will present our recent results on CD-based supramolecular chemosensors for detecting bicarbonate anion, potassium cation, and D-glucose and other monosaccharides in aqueous media.