Boronic Acids: Recognition, Sensing and Assembly

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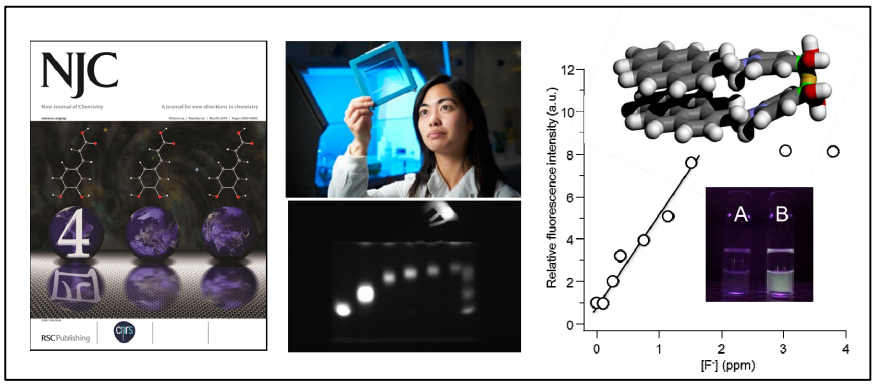
Brief Biography: He is a Professor at the University of Bath where his research interests include many aspects of Supramolecular chemistry, including: molecular recognition, molecular self-assembly and sensor design. Within the area of molecular recognition his research has a particular focus on boronic acid based receptors for the fluorescence sensing of saccharides. He has developed a broad interdisciplinary approach to research, with an underpinning focus on the development of modular sensors where he has pioneered a range of reporting regimes. He has been a visiting professor at Tsukuba, Osaka and Kyushu Universities and is a guest Professor at East China University of Science and Technology, Xiamen University, Shandong Normal University, Nanjing University and is a Haitian Scholar at Dalian University of Technology. He has published over 160 publications, including one book, 9 book chapters and 159 papers in international peer reviewed journals. He has an h-index of 45. He led a Japan-UK team awarded a 2013 Daiwa-Adrian Prize for scientific collaboration.

Lecture Content: The ability to monitor analytes within physiological, environmental and industrial scenarios is of prime importance. Since recognition events occur on a molecular level, gathering and processing the information poses a fundamental challenge. Therefore robust chemical molecular sensors “chemosensors” with the capacity to detect chosen molecules selectively and signal this presence continue to attract considerable attention. Real-time monitoring of saccharides is of particular interest, such as D-glucose in blood. Towards that end the covalent coupling interaction between boronic acids and saccharides has been exploited with some success to monitor the presence of such saccharides. The boronic acid Lewis acid-base interaction is also suitable for the capture and recognition of anions. Anions are involved in fundamental processes in all living things. Our aim as synthetic chemists is to mimic nature’s level of sophistication in designing and producing chemosensors capable of determining the concentration of a target analytes (ie saccharides and anions) in any medium.



One recent and particularly interesting application to be presented is the use of boronic acid based receptors for protein glycation analysis. Protein glycation is an important biomarker for age-related disorders such as diabetes and Alzheimer’s disease. This process whereby reducing saccharides react with amino groups of proteins ultimately leads to the formation of complex and stable advanced glycation endproducts (AGEs). Glycation compromises proteins throughout the body resulting in many diabetes related complications (e.g., nerve damage, heart attack, and blindness). Glycated proteins and their resulting AGE products are also key elements in the pathology of Alzheimer’s Disease.

Selected recent references:

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