1st International Forum on Applied Chemistry

Date; Wednesday 19th March 2014
Venue: Medium Conference Room of International Center (1st floor)

Program

13:30; Opening Remarks Professor Katsumi Uchiyama

Chair; Yuji Kubo

13:35 – 14:05; Dr. Manabu Tanaka (Tokyo Metropolitan University)

Ion Conductive Polymer Nanofibers: Application to Polymer Electrolyte Fuel Cells

Electrospun polymer nanofibers have been extensively studied because of their unique properties and wide applications. Here I present our recent work on ion conductive nanofibers and their application to polymer electrolyte fuel cells. Intrinsic proton conductivities of sulfonated polyimide nanofibers were measured by aligning the nanofibers between parallel electrodes. Anion conductive nanofibers were first prepared, and their conductivities were evaluated. Novel composite membranes containing various nanofibers were fabricated to show distinguished proton conductivities under low humidity conditions by utilizing inside and interface of nanofibers. Organic nanoionics on ion conductive nanofibers are academically interesting as well as their practical applications to fuel cells.

14:05 – 14:35; Dr. Kiyoshi Sato (Tokyo Metropolitan University)

Synthesis of Polycyclic Heteroaromatic Cations

Azonia derivatives of coronene and helicene are highly soluble polycyclic heteroaromatic cations with planar disk-shaped and helically twisted conformations, respectively. These π-electron systems are effective electron- accepting chromophores associated with the presence of bridgehead quaternary nitrogen atoms. Recently, they have also received growing interest because of being considered as a valuable model compound for nitrogen-doped graphene. In this lecture, an overview of the photochemical syntheses of these unique compounds from our earlier work and recent results will be presented together with their core chemical and physical properties. Moreover, their potential applications will be discussed.

14:35 – 15:35; Professor Tony D. James (University of Bath)

Boronic Acids: Recognition, Sensing and Assembly

His brief biography and lecture content are shown in next page.

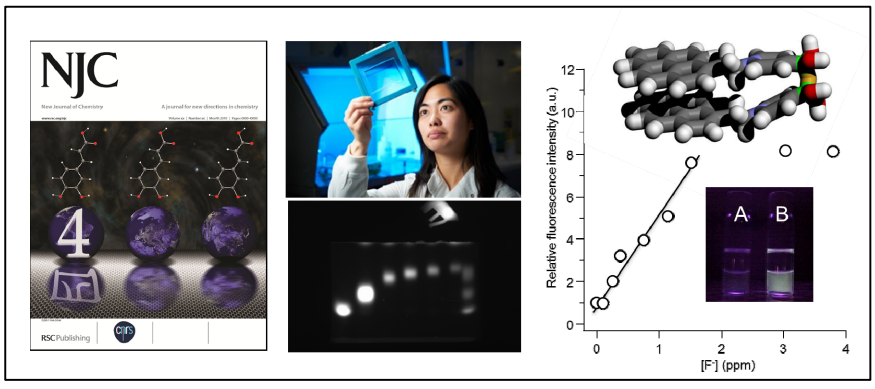
Boronic Acids: Recognition, Sensing and Assembly

Tony D James

Department of Chemistry, University of Bath, Bath, BA2 7AY UK.
Email: t.d.james@bath.ac.uk Web: www.chemosensors.com

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:

[1] S. D. Bull, M. G. Davidson, J. M. H. van den Elsen, J. S. Fossey, Y. Kubo, F. Marken, A. T. A. Jenkins, Y.-B. Jiang, K. Sakurai, J. Zhao, T. D. James, *Acc. Chem. Res.*, **2013**, *46*. 312–326.
[2] X. Wu, Z. Li, X.-X. Chen, J. S. Fossey, T. D. James, Y.-B. Jiang, *Chem. Soc. Rev,* **2013**, *42*, 8032-8048
[3] Y.-J. Huang, W.-J. Ouyang, X. Wu, Z. Li, J. S. Fossey, T. D. James and Y.-B. Jiang *J. Am. Chem. Soc,* **2013**, *135*, 1700–1703.
[4] X. Sun, S.-Y. Xu, S. E. Flower, J. S. Fossey, X. Qian and T. D. James, *Chem. Commun,* **2013**, *49*, 8311-8313