



The 3rd International Forum on Applied Chemistry

Date: Friday, September 1, 2017

*Venue: Conference Room of International House,
Tokyo Metropolitan University*

Program

14:00; Opening Remarks by Professor Shinsuke Takagi

Chair; Yuji Kubo

14:05 – 14:50; Professor Steven Bull (University of Bath)

Synthesis as an Inspiration for Sustainability and Sensing

There is increasing awareness that society needs to develop more sustainable routes to fine chemicals, drugs and polymers that are currently sourced from non-renewable petroleum sources. Terpenes represent an abundant class of biorenewable natural products whose relatively non-oxygenated hydrocarbon skeletons contain alkene functionalities that are well suited as potential 'drop-in' substrates for existing industrial processes. We will demonstrate how catalytic transformations of terpenes such as limonene might be used to develop an industrial biorefinery approach for the synthesis of a range of value-added chemical products that are currently sourced from non-renewable petroleum sources. Our research into using boron compounds to develop simple three-component chiral derivatization protocol for determining the enantiopurity of chiral amines, diols, diamines, amino-alcohols and *N*-hydroxylamines using NMR spectroscopy, cyclic voltammetry or circular dichroism will be described.

14:50 – 15:20; Assoc. Professor Shoichiro Asayama

(Tokyo Metropolitan University)

Plasmid DNA Delivery System Based on Zn²⁺ Ions for Up-Regulation of Gene Expression

The plasmid DNA (pDNA) complex with Zn²⁺ ions and the methylated poly(1-vinylimidazole) (PVIm-Me) has been designed. The resulting Zn²⁺/PVIm-Me/pDNA ternary complexes have delivered both Zn²⁺ and pDNA inside cells, leading to the nuclear translocation of the pDNA. The intracellular co-delivery of Zn²⁺ and the pDNA, which contains a nuclear protein binding sequence, has enhanced gene expression. These results suggest that the intracellular Zn²⁺, delivered by the ternary complexes, activated the nuclear protein to enhance the nuclear translocation of the pDNA. Consequently, the pDNA delivery system based on Zn²⁺ for up-regulation of the gene expression has been demonstrated.

15:20 – 15:30; Break

15:30 – 16:15; Professor Kazuo Sakurai (The University of Kitakyushu)

Characterizing Self-Assembled Nanoparticles of Drug Delivery by use of Solution Scattering Techniques

The potential of supramolecular self-assembly to produce sophisticated structures and functions has attracted significant attention to the systems. The driving forces for such supramolecular self-assembly consist of multiple anisometric inter- and intra-molecular interactions, including hydrophobic, van der Waals, electrostatic, and π - π interactions. Individually, each interaction is subtle and insignificant but their combination and balance essentially determine the assembled structures. This chemistry offers diverse techniques to design nanoparticles employed for drug delivery systems (DDSs). Characterizing the inner structures of such particles is essentially important. This presentation reviews our recent studies on such issue, focusing on polymeric micelles for anti-cancer delivery, cationic micelles for gene delivery, and a polysaccharide carrier for siRNA. One of our final goals is to visualize their inner structures by combining small angle X-ray scattering and light scattering coupled with separation techniques.

16:15 – 17:00; Professor Tony James (University of Bath)

Boronic acids as Chemosensors

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. Our aim is to mimic nature’s level of sophistication in designing and producing chemosensors capable of determining the concentration of a target species such as: saccharides, glycosylated proteins, anions and reactive oxygen/nitrogen species (ROS/RNS) in any medium.

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