大阪大学 OSAKA UNIVERSITY

rijksuniversiteit groningen

INSD NanoScience Video Exchange Lectures (2017, Groningen-Osaka)

These lectures are held as a part of **"Fundamental and functional properties of nanomaterials"** in top Master NanoScience in Groningen and **"International Exchange Lectures on Nanoscience and Nanotechnology A"** in Nano Program of INSD in Osaka. The programs are also shared by University of Science-Malaysia and King Mongkut's Institute of Technology Ladkrabang Thailand.

The sessions start on the following Friday at 9:00 in the morning (Groningen time), that is, at 16:00 or 17:00 in the afternoon (Osaka time).
[NOTE The Netherlands switches from summer time (day light saving time) to winter time on the night of 29 October (Sun) 01:00 (UTC) 2017.]

Lecture 1

Friday 20, Oct. 2017
Osaka time: 16:00-18:15
Groningen time: 9:00-11:00

Chair: Prof. Tadashi Itoh

Prof. Akira Harada, Graduate School of Science (speaks 16:00-16:45 (O) / 9:00-9:45(G))
(Field: macromolecules, self-assembly, self-healing)

Title: Supramolecular materials.

Abstract: Macromolecular recognition is classified as main-chain recognition and side chain recognition. Main-chain recognition is involved in the formation of polyrotaxanes in which some cyclic molecules are threaded onto a polymer chain. We have studied on the relative movement of cyclic parts and a linear chain. We can control the rates and the direction of the cyclic parts on a polymer chain. In addition, we have achieved macroscopic self-assembly and self-healing systems through side-chain recognition.

Chair: Prof. Graeme Blake

Prof. Graeme Blake (speaks 10:00-10:45 (G) / 17:00-17:45 (O))
(Field: Solid State Materials for Electronics)

Title: Recent developments in thermoelectric materials.

Abstract: Thermoelectric materials are of great interest in the field of sustainable energy due to their potential for converting thermal energy such as waste heat to electrical power, as well as in solid-state cooling systems. The performance of a thermoelectric material is determined by striking a delicate balance between high electrical conductivity, high thermopower and low thermal conductivity. The main classes of thermoelectric materials will be introduced, followed by an overview of possible approaches to optimize the above parameters, with a focus on relationships between crystal structure, electrical and thermal transport.

Lecture 2

Friday 27, Oct. 2017

Osaka time: 16:00-18:15

Groningen time: 9:00-11:00

Chair: Prof. Tadashi Itoh

Prof. Keiji Hirose, Graduate School of Engineering Science (speaks 16:00-16:45 (O) / 9:00-9:45(G))

(Field: supra-molecular chemistry)

Title: Molecular devices and machines.

Abstract: During the last few decades chemists have been extending the concept of a macroscopic machine to the molecular level thanks to marked, synthetic improvements. The extension of the concept of a machine to the molecular level is of interest not only for the sake of basic research, but also for the growth of nano-science and the subsequent development of nanotechnology. After a general introduction to molecular machines and molecular devices, exemplified methods for the construction including technical breakthroughs and paradigm shifts, representative researches and applications of molecular machines and molecular devices will be presented.

Chair: Prof. Maria Loi

Prof. Maria Loi (speaks 10:00-10:45 (G) / 17:00-17:45 (O))

(Field: supra-molecular structure for organic devices)

Title: Colloidal Quantum Dot Solids – a new frontier in opto-electronics.

Abstract: One of the long-standing hopes for quantum mechanics and nanotechnology is that they will give us the ability to fully design the physical properties of materials. Colloidal quantum dots, and nanostructured semiconductors in general, carry the promise of overcoming the limitations of classical materials in chemical and physical properties and in processability. I will be discussing how will be possible to obtain a sufficient control of electronic properties of colloidal quantum dots arrays, such as carrier concentration and carrier mobility to fulfill the promises. At the end I will show that the electronic properties of PbS colloidal quantum dot films can be fine-tuned by adjusting their stoichiometry, using the large surface area of the nanoscale building blocks.

Lecture 3

Friday 10, Nov. 2017

Osaka time: 17:00-19:15
Groningen time: 9:00-11:00 (in winter time)

Chair: Prof. Hiroko Tamagaki

Prof. Syoji Ito, Graduate School of Engineering Science (speaks 16:00-16:45 (O)/ 9:00-9:45 (G))
(Field: laser manipulation, single-molecule detection)

Title: Single-molecule fluorescence detection: methods and applications.

Abstract: The lecture starts with the history of single-molecule fluorescence detection (SMFD) and the introduction of typical methods of SMFD: confocal and wide-field microscopies. Then several important applications of SMFD are shown, e.g. fluorescence correlation spectroscopy, single-molecule tracking, and super-resolved fluorescence imaging.

Chair: Prof. Thomas Jansen

Prof. Thomas Jansen (speaks 10:00-10:45 (G) / 17:00-17:45 (O))
(Field: computational spectroscopy and optical properties)

Title: Quantum design of nanomaterials.

Abstract: Quantum mechanics is determining the properties of materials on the atomic scale. Macroscopic systems on the other hand can be described well with classical dynamics. In this talk quantum mechanical effects on the nanometer length scale will be discussed. First, the delocalization of electronic wave functions over nanoscale super molecular structures will be discussed. Secondly, the effect of quantum interference between such wave functions will be discussed and how this phenomenon can be used to design materials with desirable properties and suppressed (or enhanced) charge recombination in heterojunction materials and exciton-exciton annihilation in light-harvesting systems.

Lecture 4

Friday 17, Nov. 2017

Osaka time: 17:00-19:15
Groningen time: 9:00-11:00 (in winter time)

Chair: Prof. Tadashi Itoh

Prof.Yasufumi Fujiwara, Graduate School of Engineering (17:00-17:45 (O) /9:00-9:45(G))
(Field: rare-earth-doped semiconductors, OMVPE growth, LED, luminescence, energy transfer)

Title: Fundamentals of light-emitting diode with rare-earth-doped semiconductors.

Abstract: After the groundbreaking invention of blue and green light-emitting diodes (LEDs) employing nitride semiconductors ($In_xGa_{1-x}N$/GaN), there has been a strong demand to develop red LEDs using nitride semiconductors. We have focused on europium (Eu) ions that have been widely used as an activator for red phosphor, and have succeeded in growing Eu-doped GaN (GaN:Eu) layers with high crystalline quality by atomically-controlled organometallic vapor phase epitaxy (OMVPE), as well as developing the world's first red LED that operates at room temperature using GaN:Eu as the active layer. This lecture will cover current status of conventional GaN-based LEDs and the GaN:Eu red LED, present understanding of Eu luminescent sites formed in GaN and future strategies for the improved light output of the LEDs.

Chair: Prof. Thomas Jansen

Prof. Remco Havenith (speaks 10:00-10:45 (G) / 18:00-18:45 (O))
(Field: Theoretical Chemistry)

Title: Magnetic properties of molecules.

Abstract: I shall talk about the calculation of molecular properties. Techniques for calculating properties will be discussed and examples of applications will be shown. Topics that will be discussed are the calculation of magnetically induced current densities, and photo-physical properties of materials with application in organic photovoltaics, and the calculation of singlet-triplet transition probabilities.