INSD NanoScience Video Exchange Lectures (2019, Groningen-Osaka)

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

The lectures except for October 11th start on the following Fridays 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 27 October (Sun) 01:00 (UTC) 2019.]

Lecture 0

Friday 11, Oct. 2019
Osaka time: 16:00-18:15 (no exchange lecture from Groningen))

Prof. Tadashi Itoh, Institute for NanoScience Design (speaks 16:00-18:15 (O))
(Field: solid state physics, semiconductor nanocrystal (quantum dot), optical properties)
Title: Introduction, Photophysics of quantum dots.
(Together with video address and Nobel-Prize lecture given by Prof. Benard L. Feringa)
Abstract: Electronic excited states (excitons) in semiconductor nanocrystals show peculiar quantum size effects which exhibit various kinds of characteristic optical properties; blue shift and splitting of the exciton energy states, rapid radiative decay, ultrahigh speed giant optical nonlinearity, highly efficient lasing, etc.

Lecture 1

Friday 18, Oct. 2019
Osaka time: 16:00-18:15
Groningen time: 9:00-11:00

Chair: Prof. Tadashi Itoh
Prof. Akira Harada, Graduate School of Science (16:00-16:55 (O) / 9:00-9:55(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. Thomas Jansen
Prof. Jan Anton Koster (10:00-10:55 (G) / 17:00-17:55 (O))
(Field: Photophysics and optoelectronics, semiconductors and devices, thermoelectrics)

Title: Organic semiconductors for thermoelectrics

Abstract: In this lecture, I will introduce organic semiconducting materials and will briefly review their charge transport properties. Next, I will emphasize their promise for thermoelectric applications.

Lecture 2

Friday 25, Oct. 2019

Osaka time: 16:00-18:15
Groningen time: 9:00-11:00

Chair: Prof. Tadashi Itoh

Prof. Syoji Ito, Graduate School of Engineering Science (16:00-16:55 (O)/ 9:00-9:55 (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. Remco Havenith (speaks 10:00-10:55 (G) / 17:00-17:55 (O))
(Field: Theoretical Chemistry)

Title: Calculation of molecular properties

Abstract: I shall talk about the calculation of molecular properties. Techniques for calculating properties will be discussed and examples of applications will be shown. Main topics that will be discussed is the calculation of magnetically induced current densities and NMR chemical shifts.

Lecture 3

Friday8, Nov. 2019

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 (17:00-17:55 (O) /9:00-9:55(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. Loredana Protesescu (10:00-10:55 (G) / 18:00-18:55 (O))
(Field:)
Title: Perovskite nanostructures
Abstract: not yet fixed

Lecture 4

Friday 15, Nov. 2019
Osaka time: 17:00-19:15
Groningen time: 9:00-11:00 (in winter time)

Chair: Prof. Tadashi Itoh
Prof. Hidekazu Tanaka, Institute of Scientific and Industrial Research
(17:00-17:55 (O) /9:00-9:55(G))
(Field: electronic and optical properties of oxide thin films)
Title: Oxide thin films and their functionality
Abstract: not yet fixed

Chair: Prof. Thomas Jansen
Prof. Thomas la Cour Jansen (speaks 10:00-10:55 (G) / 17:00-17:55 (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.