

第 42 回生体医歯工学公開セミナー

日時: 2026 年 7 月 14 日 (火) 14:00~16:00

場所: 東京科学大学すずかけ台キャンパス R2 棟 1 階 OCS 会議室 1

講師 1: Prof. Dr. Han Li (Collegium Researcher), University of Turku, Finland

講演題目 1: Predictability via Interface Controllability: Sorting and Optical Responses of Structure-Defined Carbon Nanotubes

概要

Single-wall carbon nanotubes (SWCNTs) provide atomic-level structural precision, but this precision can lead to predictable device function only when the molecular interface around each nanotube is controlled. In this talk, I will discuss how surfactant wrapping affects both the optical response and aqueous two-phase extraction (ATPE) sorting of structure-defined SWCNTs.

Using precisely tuned surfactant mixtures, we separate single-chirality and enantiomeric SWCNTs and describe their sorting behavior with the partition coefficient change condition (PCCC). Recent absorption studies show that different surfactant coatings can modify the optical transition energies of nanotubes in a structure-dependent manner. These optical changes provide a simple readout of how surfactants reorganize on the nanotube surface during exchange and competition.

Together with molecular simulations, these results suggest that surfactant packing, surface coverage, and local water access play key roles in determining both optical spectra and ATPE selectivity. This interface-centered view helps connect nanotube structure, molecular wrapping, and predictable sorting behavior, and provides a basis for designing better SWCNT building blocks for nanophotonics, optoelectronics, and biomedical materials.

講師 2: Prof. Dr. Dmitry Levshov (Researcher Expert), University of Antwerp, Belgium, & Specially Appointed Associated Professor, First, IIR, Science Tokyo

講演題目 2: Optical Spectroscopy for Structural Characterization of Carbon Nanotube-Based 1D van der Waals Heterostructures

概要

One-dimensional van der Waals (1D vdW) heterostructures are an emerging class of nanomaterials formed by coaxially assembling nanotubes of different types, such as carbon, boron nitride, and transition-metal dichalcogenides, via van der Waals interactions. This 1D architecture gives rise to tailored functionalities and to new physical phenomena driven by intertube coupling and quantum confinement.

Determining the structure of these systems is key to understanding and exploiting their properties, and optical spectroscopy provides a powerful, non-invasive route to do so. Using single-wall carbon nanotubes as a model system, I will show how key structural parameters can be determined through complementary techniques: optical and infrared absorption, Raman and photoluminescence spectroscopy, and their chiroptical counterparts. I will then extend these concepts to 1D vdW heterostructures and more complex supramolecular assemblies, showing, through examples from our recent work, how spectroscopic signatures evolve with structural complexity and what they reveal about intertube interactions, pointing to new directions for characterizing 1D vdW materials.

未来産業技術研究所 HP)

https://www.first.iir.isct.ac.jp/detail_2125/

お問い合わせ先)

平田 祐樹(ものづくり基盤技術・社会実装研究コア・准教授)

張 鋭璽(ものづくり基盤技術・社会実装研究コア・助教)