第239回 OPERA研究交流セミナー
第230回 ISIT有機光エレクトロニクス研究特別室セミナー
第297回 未来化学創造センターセミナー

日時：2024年5月1日(水) 15：00～
場所：ISI棟3階 セミナー室

Diverse Photophysics of Novel Organic Luminogens: from Mechano-luminescence to AIE to Triplet Harvesting

Prof. Partha Hazra
Indian Institute of Science Education and Research (IISER) Pune, India

In my presentation, I will talk about the intriguing properties of our recently developed functional organic luminogens, which have been under development for the past five years. Initially, I will shed light on mechano-luminescence, a phenomenon that has garnered significant attention due to its potential applications in force sensors, lighting, displays, damage detection, bio-imaging, and phototherapy. However, predicting the mechano-luminescence behavior in novel organic luminogens remains a daunting challenge, as a concrete design strategy has yet to be established. In our research, we unveil a distinctive strategy aimed at establishing a structure-property relationship for the design of multi-stimuli responsive mechanoluminescent materials. Our findings demonstrate that subtle adjustments to the donor moiety play a pivotal role in regulating molecular packing and metastable energy states in the solid phase, consequently influencing optical properties and multi-stimuli responsive behaviors. By correlating these solid-state behaviors with molecular structures, we ascertain that the synergistic interplay between twisting, conformational flexibility of the donor moieties, and various non-covalent interactions imbue the materials with multi-stimuli responsive capabilities. After that, I will demonstrate a strategic approach to circumvent the issue of ACQ effect, which typically hampers the luminescence quantum yield of organic molecules. This strategy not only facilitates the achievement of AIE and RTP but also enables Mechano-luminescence from a pure organic luminogen. At last part of my talk, I will discuss our recent findings on triplet exciton harvesting through TADF. Here, I will discuss on a strategy for modulating TADF behaviors in donor-acceptor-based regio-isomers without altering the donor-acceptor groups. Then, I will also show our recent (unpublished results) work related to a set of aggregation induced delayed fluorescent (AIE-DF) emitters, where we have shown a minimal structural variation between S1 and T1 states in the solid state highlighting its importance in eliciting such properties. Also, I will discuss on our very recent project (unpublished results) on the modulation of emission characteristics by donor substitution in multiple resonant thermally activated delayed fluorescent emitters.

主催：九州大学　最先端有機光エレクトロニクス研究センター
　　：財団法人九州先端科学技術研究所（ISIT）
共催：九州大学　未来化学創造センター