IBS Center for Molecular Spectroscopy and Dynamics

Seminar

- **SPEAKER**
  Dr. Lee Kwang Jin (IBS Center for Molecular Spectroscopy and Dynamics)

- **TITLE**
  Tailoring photophysics based on nanophotonics: toward metadevices

- **ABSTRACT**

Tuning, manipulating, and controlling photophysical processes are extremely important not only in revealing new fundamental mechanism but also in developing novel optoelectronic devices. To this end, hybrid platform consisting of active material and nanophotonic structure is one of the most attractive strategies for activating the photophysical properties, which can impact on various applications such as light emitting devices, quantum information processing, photocatalysis activation, tunable photodetection and energy harvesting devices.

In this talk, I will present my works devoted to this topic based on the ultrafast time-resolved spectroscopy, a powerful tool to study photophysics, and discuss the future work beyond the previous study. First, I will introduce the nonlocal control of photophysical processes in organic-nanophotonic hybrid structures. I will show the experimental evidence that a metamaterial structure can slow down the charge transfer process in organic semiconductors, which is rationalized by extended Marcus theory taking into account an image dipole interaction1. Based on this, we demonstrated that the distance dependent charge transfer rate can be altered by metamaterials2 and revealed the charge transfer modulation by manipulating the optical intensity3. Next, I will present the spectral shift of intramolecular charge transfer emission by nonlocal effect of hyperbolic metamaterials4, which would be very important in developing novel light emitting devices. I will also present my recent study on the exciton dynamics in 2D MoS2-hyperbolic metamaterial hybrid structure in which we unraveled that energy transfer efficiency can be enhanced by metamaterials5. Finally, I will introduce my future research plan and discuss the potential importance. Overall results show the great potential to control various light-matter interactions and will provide a significant step forward in enabling next-generation hybrid optoelectronic devices.

- **DATE AND VENUE**
  April 22, 2020 (Wednesday, 5:00 - 6:00)
  Seminar Room B (119), KU R&D Center