화학과 대학원 세미나

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Vibration Induced Emission and Assembly Induced Emission

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Organic fluorescent π-systems with dynamic excited states have played a significant role in the fields of chemistry, biology and materials science due to their intriguing photochemical and photophysical properties. These molecules usually experience two or more emissive excited states and undergo elaborate photophysical processes involving excited state planarization. They adopt a butterfly-like bent conformation in the ground state (S0) and relax to a nearly planar structure in the lowest-lying excited state (S1) upon photoexcitation. Sterically hindered dihydrophenazines are a class of dynamic molecules and further developed by Tian and Chou in 2015. The bent-to-planar excited-state dynamics, which we termed vibration-induced emission (VIE), have introduced new features e.g., large Stokes shifts and multicolor emission with molecular intrinsic character. In this lecture, we will highlight the recent progress on this topic.

Pure organic emitting materials with room-temperature phosphorescence (RTP), showing large Stokes shifts with long emitting lifetime, low preparation cost, good processability, and wide applications in analysis, bioimaging, organic light emitting diode, and so forth, have been drawing great attentions recently. Related to the design strategy for metal-free RTP materials, the phosphors containing heavy atoms and other heteroatoms to facilitate the singlet-to-triplet intersystem crossing (ISC) to populate the triplet are usually employed. Besides this factor, the pathways of nonradiative relaxation are inhibited as much as possible. We proposed a new concept as “Assembling-Induced Emission” to facilitate ISC and reduce nonradiative relaxation via supramolecular dynamic assembling. This assembling-induced emission strategy is applicable in many emissive assembling systems achieved in our labs. We hope this concept will be a helpful guide for understanding the emissive mechanism and constructing strategy of various emissive materials.

He TIAN is Distinguished Professor at East China University of Science & Technology (ECUST) and he received his Ph.D. degree from East China University of Science & Technology (ECUST) in 1989. He was appointed Cheung Kong Distinguished Professor by the Education Ministry of China in 1999. He is a member of the Chinese Academy of Science and a Fellow of the World Academy of Sciences (TWAS) for the advancement of science in developing countries. Prof. Tian serves as Vice President of Chinese Chemical Society and Associate Editor of ACS Applied Materials and Interfaces since 2019. His current research interests focus on the development of interdisciplinary materials science and molecular systems including molecular switches, dynamic chemistry and supramolecular chemistry. He has been listed as a Highly Cited Researcher every year in the area of Chemistry by Web of Science since 2014. He has received the State Natural Science Award (2nd Class; 2007) from the Chinese Government, Shanghai Scientific Technology Meritorious Award (2019) and France-China Chemistry Lectureship Award (2016).