

Seminar

Date: Thu. 8th Feb. / Time: 14 am – 15 am / Place: Room 408F, Building T1

334 Nguyễn Trãi, Thanh Xuân, Hà Nội

Kính mời thầy cô và các bạn quan tâm đến dự / Everyone is welcome !

Speaker: Dr. Trinh Minh Tuan (Department of Electrical Engineering and Computer Science, the University of Michigan)

Title: Light-Matter Interaction in Nano-Materials for Optoelectronic Applications

Abstract: Ultrafast spectroscopies have long been powerful tools for the understanding of novel chemical and physical dynamics such as quantum coherence, electronic and vibrational interaction, and dynamic relaxation in coupled quantum systems. An example includes, among others, a femtosecond transient absorption (fs-TA). In fs-TA, an energetic pulse (the “pump”) resonant with an electronic transition of the studied system creates an excited state; the subsequent temporal evolution of the system is monitored by measuring the transmission change of a delayed, weak pulse (the “probe”). In this talk, I will present the use of fs-TA for investigating quantum phenomena in nano-materials. The particular interest is singlet fission in organic conjugated molecules.

Singlet fission is a spin-allowed process which takes place in organic semiconductors whereby a photoexcited singlet exciton splits into two triplet excitons. By generating two excitons upon a single absorbed photon, SF has the potential to enhance power conversion efficiency of solar cells up to 44%, well exceeding the Shockley-Queisser limit of 31% for a single junction solar cell. As yet, highly efficient SF has only been found as inter-molecular SF, which requires an appropriate inter-molecular coupling. In photovoltaic applications, there remain fundamental challenges for SF: (i) there is a limited number of molecules that undergo SF and (ii) devices that exploit SF are confined to a bilayer architecture. Here, I present a new form and highly efficient singlet fission, intra-molecular SF, which takes place within a single molecule. In this case, the SF rate does not depend on the inter-molecular coupling, and extracting multiple excitons can be exploited in a bulk heterojunction.

Biography: Dr. Trinh is currently an adjunct Associate Research Scientist in the Department of Electrical Engineering and Computer Science at the University of Michigan. His research is highly interdisciplinary that spans from ultrafast optics and optical materials to nanostructured materials for photonic applications. He received his B.S. and M.S. degrees in Physics from Vietnam National University, Hanoi in 2002 and from Chungbuk National University, South Korea in 2005, respectively. In 2010, he obtained his Ph.D. degree in Opto-electronic Materials from Delft University of Technology, the Netherlands. Additionally, he completed his 3 years Postdoctoral Fellow at the University of Amsterdam and University of Texas at Austin; 2 years as a Postdoctoral Fellow and 2 years as an Associate Research Scientist at Columbia University.

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