CENIDE & WIN Seminar Series on 2D-MATURE

DFG IRTG 2803 & NSERC CREATE

Tong Zhu

Laser Micro/Nano Fabrication Laboratory

"Carrier Transport and Charge Transfer Dynamics In 2D Materials and at 2D Heterostructure Interfaces"

June 29th, 2023
10:00 a.m. ET / 16:00 p.m. CET

Prof. Tong Zhu is a full professor at Lab of Laser Micro/Nano Fabrication, School of Mechanical Engineering, Beijing Institute of Technology(BIT), China. She also serves as the Associate Chair of Manufacturing Engineering Department at BIT, and the Deputy Director of Laser Micro/Nano Fabrication Laboratory at BIT. Her research focused on imaging charge carrier dynamics and transport by high spatial-temporal resolution techniques. She earned her Ph.D. from Purdue University, United States in 2017, followed with postdoctoral experience before joining the BIT faculty. She was elected the High-level Overseas Talent in 2019. Prof. Zhu authored (first /corresponding) high quality academic articles such as Science Advances, Advanced Materials, ACS Energy Letters, Accounts of Chemical Research, Small Methods, Annual Review of Physical Chemistry, JPC Letters, etc. Since becoming a principal investigator at BIT, her research proposals related to ultrafast dynamics microscopy have secured over 17 million RMB in funding. She is now serving as the Youth Editorial Board Member of Nano Research Energy, as well as guest editor of the journal Materials. She has delivered 12 keynote/invited talks/lectures at international conferences, as well as prestigious universities and institutions:

Energy Flow mechanisms of photophysical processes have vital importance in guiding rational design and boosting efficiencies of optoelectronic devices. However, these processes usually take place on ultrafast timescale and in ultrasmall space, which make it challenging to study. We built ultrafast transient absorption/reflection microscopy (TAM) and simultaneously achieved 150 fs temporal resolution and 20 nm spatial precision. (1) We probed electron transfer and energy transfer of a mixed-dimensional organic-inorganic hybrid VdW heterostructure interface and directly visualized rapid interlayer CT exciton transport, which has been proposed to benefit charge separation at D-A interface. (2) We revealed energy funneling mechanism and carrier transport behaviors in 2D perovskite films. We anticipate that the asynchronous charge transfer mechanism could be used to design appropriate acceptor-donor ratios for better performance of optoelectronic devices. (3) We also employed TAM to direct visualize carrier transport in 2D MXenes. We revealed that band transport propagates over 400 nm within 200 fs after photon-excitation. Through morphological imaging, we also showed the ability of carriers to cross overlapping grain boundaries.