北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Seminar

Investigating electronic and molecular structure/dynamics by time resolved ultrafast non-linear spectroscopy

Wei Xiong

University of California- San Diego

Time: 16:00pm, December 17, 2015 (Thursday)

时间：2015年12月17日 （周四）下午16:00

Venue: Room w563, School of Physics , Peking university

地点：北京大学物理学院，西563会议室

Abstract

The molecular and electronic structure/dynamics of complex interfaces between two matters are difficult to be completely characterized by the existing spectroscopies. While vibrational sum frequency generation (SFG) spectroscopy can elegantly isolate the signal from interfaces, and provide great insights of the chemical compositions and structures on interfaces, there are still challenges that complicate the spectral interpretations. These challenges include that (1) inhomogenesouly distributed molecules on interfaces can severely broaden the spectra, (2) sub-monolayer surface coverage leads to low signal to noise level and (3) molecular dynamics are on the femto to picosecond timescales, which requires ultrafast time resolution.

Our group recently developed and used two techniques extended from vibrational SFG spectroscopy: electronic SFG and femtosecond 2D SFG spectroscopies, to overcome the above-mentioned challenges, in order to study interfaces of materials. In the first part of my talk, I will present our work of using electronic SFG spectroscopy to determine the electronic structure of the organic/inorganic hybrid photovoltaic interfaces, where we found that the electronic structures of the organic semiconductor are more uniform than the bulk. In the second part, I will discuss our recent developments on heterodyne 2D SFG spectroscopy, in order to unambiguously reveal the orientation and vibrational dynamics of molecular catalysts on heterogeneous interfaces.

About the speaker

Wei Xiong is an assistant professor of Chemistry and Biochemistry at University of California- San Diego, where his group performs research in ultrafast chemical dynamics. Previously, he was a postdoctoral researcher in JILA, University of Colorado-Boulder (2011-2014). He received his Ph.D. degrees in Chemistry from University of Wisconsin-Madison in 2011, and the B.S. degree in Chemistry from Peking University in 2006. His research focuses on developing novel ultrafast, interfacial sensitive, optical spectroscopies and microscopies, in order to both space- and time-resolve charge and molecular dynamics in complex materials and biological interfaces. Dr. Xiong is the recipient of 2015 DARPA Young Investigator Awards.