



### Seminar

## Ultrafast THz-field-driven shear mode in $WTe_2$ as a topological switch

**Prof. Aaron M. Lindenberg**

*Department of Materials Science and Engineering and the Department of Photon Science*

*Stanford University*

**Time: 10: 00 Am, April 23, 2018 (Monday)**

时间: 2018年4月23日 (周一) 上午10:00

**Venue: Room W563, Physics building, Peking University**

地点: 北京大学物理楼, 西563会议室

### Abstract

Tungsten ditelluride ( $WTe_2$ ) is a layered transition-metal dichalcogenide that crystalizes in a distorted hexagonal net with an orthorhombic unit cell. The lack of inversion symmetry in this phase leads to a predicted new topological semimetal with unique optoelectronic and transport properties. Here, we use THz light pulses to trigger a structural deformation in  $WTe_2$  and probe its dynamics using femtosecond resolution electron diffraction techniques. We observe large amplitude interlayer shear oscillations at 0.24 THz with  $\sim 1\%$  strain amplitudes that occur along the in-plane transition state separating the orthorhombic and monoclinic phases of the material, identified by measuring structure factor modulations of many Bragg reflections. The response scales linearly with the applied THz field but the initial atomic displacements always occur in the direction towards that of the monoclinic phase, independent of whether the THz field is applied parallel or antiparallel to this crystallographic direction. Theoretical estimates indicate that this is consistent with a photo-doping-driven stabilization of the monoclinic ( $1T'$ ) phase of the material, a metastable phase not found in equilibrium. This work opens up new possibilities for ultrafast manipulation of the topological properties of solids and for a topological switch operating at terahertz frequencies.

### About the speaker

Aaron M. Lindenberg is an Associate Professor at Stanford University with joint appointments in the Department of Materials Science and Engineering and the Department of Photon Science. He received his B.A. from Columbia University in 1996 and his Ph.D. in Physics from the University of California, Berkeley in 2001. He was named a Faculty Fellow at Berkeley from 2001-2003 and then became a staff scientist at the SLAC National Accelerator Laboratory from 2003-2007. He is a winner of the DARPA Young Faculty Award, the Department of Energy Outstanding Mentor Award, the Alfred Moritz Michaelis Prize, and was named a Terman Fellow and a Chambers Faculty Scholar at Stanford and an I.I. Rabi Scholar at Columbia.