Ultrafast Dynamics of Transition Metal Dichalcogenides

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We are using SLACs unique X-ray and Ulfrafast Electron Diffraction Sources to capture real-time dynamics in 2D transition metal dichalcogenides. Using MeV electron diffraction (UED) we are able to study the ultrafast heating on sub-picosecond timescales of 2D materials after exciting free charge carriers by optical excitation.

Initial studies of Femtosecond X-ray Diffraction at the Linac Coherent Light Source (LCLS) revealed a compression of the interlayer distance in multilayer 2D materials upon optical laser excitation.

Early results from the Stanford Synchrotron Radiation Lightsource (SSRL) show the sensitivity of x-ray absorption spectroscopy to changes in the electronic and spatial structure of 2D materials. This sensitivity will be used to study charge injection between 2D layers, phase transitions from the 2H to the 1T Phase and the plasmonic effect of Au particles on 2D materials.