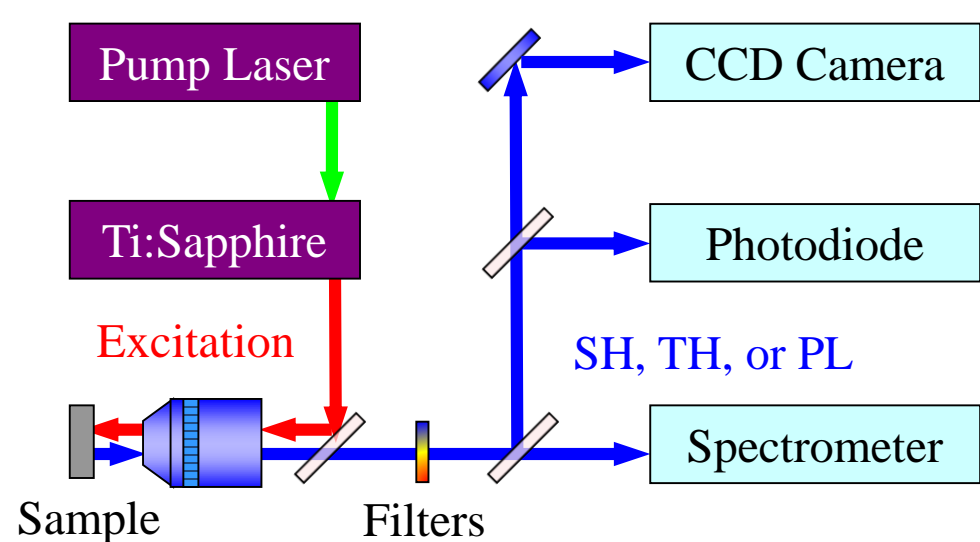
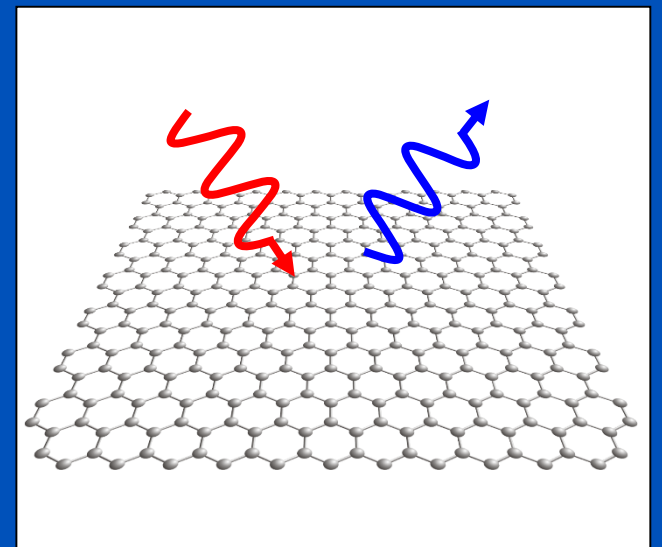


# Nonlinear Optical Properties of 2D Materials

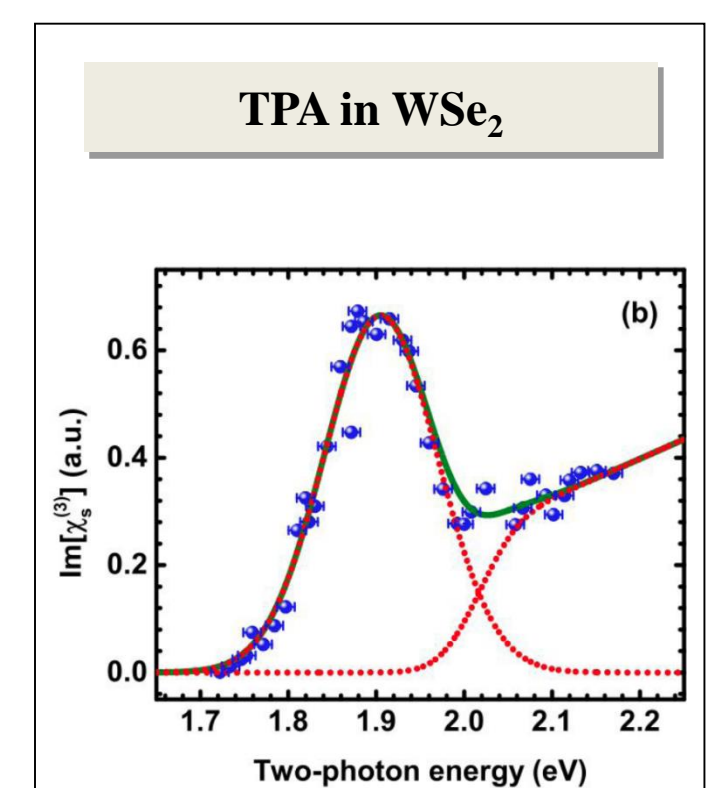
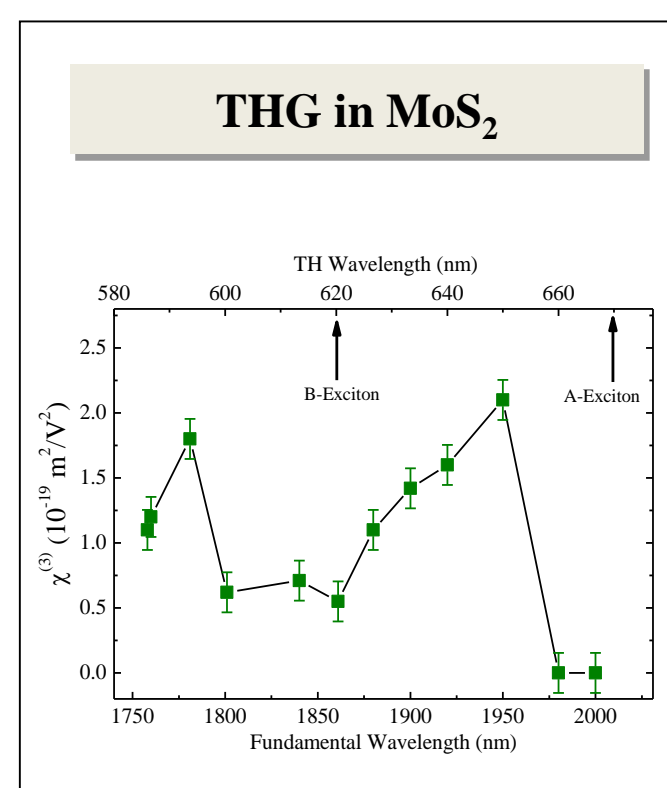
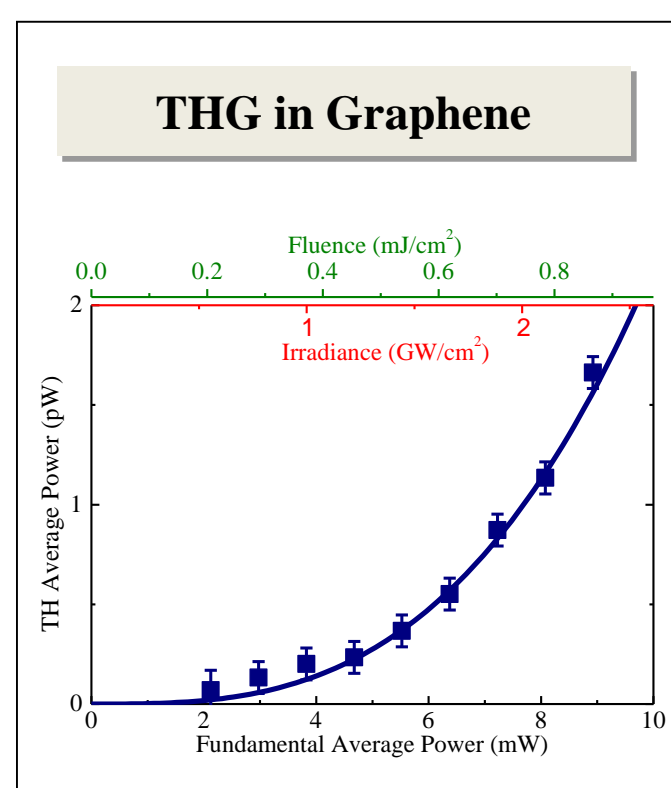
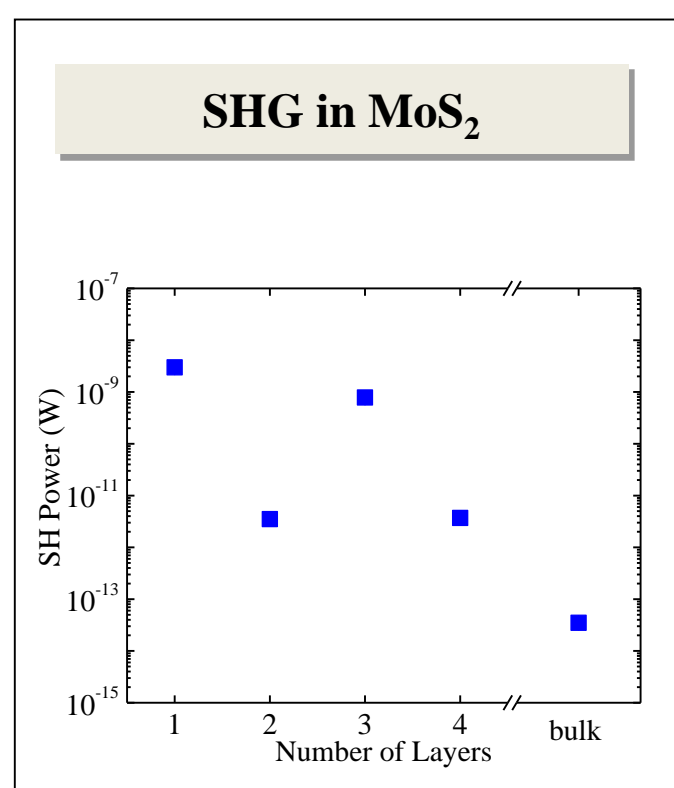
Recently, two-dimensional (2D) materials composed of single atomic layers have emerged as new promising nanomaterials. We study nonlinear optical processes, including second harmonic generation, third harmonic generation, and two-photon absorption, in 2D materials of graphene, monolayer MoS<sub>2</sub>, and monolayer WSe<sub>2</sub>. We measure their nonlinear optical susceptibilities, and use these nonlinear optical processes to determine the crystalline direction and bandgap of these materials.



## Experimental Approach

The sample is illuminated by a 100-fs laser pulse. In the harmonic generation experiments, the second harmonic (SH) or third harmonic (TH) of the incident pulse generated in the sample is collected and detected. In two-photon absorption measurements, the photoluminescence (PL) excited by two-photon absorption (TPA) of the incident pulse is used to determine the TPA coefficient.

## Main Results



## Related Publications

- Nardeep Kumar *et al*, SHG of monolayer MoS<sub>2</sub>, **Physical Review B** 87, 161403R (2013).
- Nardeep Kumar *et al*, THG in graphene and graphite thin films, **Physical Review B** 87, 121406R (2013).
- Rui Wang *et al*, THG in ultrathin Films of MoS<sub>2</sub>, **ACS Applied Materials & Interfaces** 6, 314 (2014).
- K. He *et al*, Tightly bound excitons in monolayer WSe<sub>2</sub>, **Physical Review Letters** 113, 026803 (2014).