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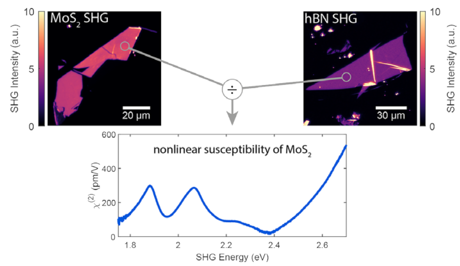
Exploiting the flat response of the crystals allows researchers to remove the influence of the laser spectrum for supercontinuum systems.



Because of their unique optical and electronic properties, ultra-thin, two-dimensional semiconductors have shown promise for their use in optoelectronic devices. Second harmonic generation (SHG) spectroscopy uses intense laser light and a material's intrinsic ability to effectively combine two photons into a single, higher-energy photon to probe this nonlinear optical property. It delivers valuable information about the electronic structure and can be used to detect the crystal orientations of two-dimensional semiconductors. New work looks to improve such measurements.

Stiehm et al. report a new method for removing the influence of the laser spectrum in SHG spectroscopy. Exploiting the flat SHG response of thin hexagonal boron nitride (hBN) crystals, the group was able to normalize the SHG spectrum. The technique can provide the calibrated nonlinear susceptibility of atomically thin materials.

The technique uses supercontinuum light, which is an ultrabroadband laser light source, and can measure a whole spectrum in one shot.

Author Steffen Michaelis de Vasconcellos hopes that the group's method will help improve SHG spectroscopy even in labs without access to supercontinuum laser sources and that calibrating with widely used hBN samples can provide a step toward standard methods in the field.

"The supercontinuum SHG spectroscopy requires a supercontinuum laser source, which is not available in every lab," he said. "However, even with a narrow bandwidth pulsed laser – which is quite common in labs doing the optical spectroscopy of 2D materials – our method will improve the SHG spectroscopy."

He said the group next looks to measure SHG spectra at cryogenic temperatures and use it to investigate two-dimensional heterostructures.

Source: "Supercontinuum second harmonic generation spectroscopy of atomically thin semiconductors," by Torsten Stiehm, Robert Schneider, Johannes Kern, Iris Niehues, Steffen Michaelis de Vasconcellos, and Rudolf Bratschitsch, *Review of Scientific Instruments* (2019). The article can be accessed at https://doi.org/10.1063/1.5100593.