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Third harmonic generation in graphene NARDEEP KUMAR, JATINDER KUMAR, CHRIS GERSTENKORN, University of Kansas, RUI WANG, University of Kansas and University of Iowa, HSIN-YING CHIU, University of Kansas, ARTHUR SMIRL, University of Iowa, HUI ZHAO, University of Kansas
— Third-harmonic generation (THG) is a third-order nonlinear optical process. In this process, the electric field of incident light generates a third-order polarization at triple frequency in matter, in addition to the linear and second-order polarizations. Radiation of this polarization gives rise to light at third-harmonic frequency. Here we report the first experimental observations of THG in graphene and few layer graphite. The samples were fabricated by mechanically exfoliating graphene flakes from a bulk graphite crystal with adhesive tapes. The flakes were deposited on Si/SiO_2 substrates. The thickness of the flakes was determined by using their optical contrasts and atomic force microscopy measurements. These flakes were irradiate by femtosecond near-infrared laser pulses. The third harmonic generated in these flakes was detected by using a spectrometer. We verified that the wavelength of the emitted light is one third of the incident light, and its intensity increases with the incident light intensity to the third power. We also studied the dependence on the third harmonic generation on the thickness of the flakes.

Hui Zhao
University of Kansas

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