

Abstract Submitted
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Ultrafast carrier and phonon dynamics in Bi_2Se_3 crystals XUNCHI CHEN, GA Inst of Tech, JINGBO QI, GA Inst of Tech, NHMFL, WENLONG YU, GA Inst of Tech, PAUL CADDEN-ZIMANSKY, DMITRY SMIRNOV, NHMFL, NORMAN TOLK, Vanderbilt University, IRENEUSZ MIOTKOWSKI, HELIN CAO, YONG P. CHEN, Purdue University, YIZHENG WU, SHAN QIAO, Fudan University, ZHIGANG JIANG, GA Inst of Tech — Ultrafast time-resolved differential reflectivity of Bi_2Se_3 crystals is studied using optical pump-probe spectroscopy. Three distinct relaxation processes are found to contribute to the initial transient reflectivity changes: a sub-ps and a few-ps electron-phonon relaxation process due to different phonon modes and a defect-induced charge trapping process. After the crystal is exposed to air, the relative strength of these processes is altered and becomes strongly dependent on the excitation photon energy. We argue that the observed behavior is likely due to the presence of Se vacancies. Further, weaker charge trapping process and vanishing air doping effect are observed in magnetically doped samples, supportive of our argument. Part of this work is published on Appl. Phys. Lett. 97, 182102(2010).

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