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Surface state-dominated photoconduction and THz-generation in topological Bi_2Te_2Se-nanowires[1] PAUL SEIFERT, Walter Schottky Insitut and Physics department, Technical University of Munich, Am Coulombwall 4a, D-85748 Garching, KRISTINA VAKLINOVA, Max-Planck-Institut für Festkörperforschung, Heisenbergstr. 1, D-70569 Stuttgart, KLAUS KERN, Institut de Physique, Ecole Polytechnique Fédérale de Lausanne, CH-1015 Lausanne, MARKO BURGHARD, Max-Planck-Institut für Festkörperforschung, Heisenbergstr. 1, D-70569 Stuttgart, ALEXANDER HOLLEITNER, Walter Schottky Insitut and Physics department, Technical University of Munich, Am Coulombwall 4a, D-85748 Garching — Topological insulators constitute a fascinating class of quantum materials with non-trivial, gapless states on the surface and trivial, insulating bulk states. In revealing the optoelectronic dynamics in the whole range from femto- to microseconds, we demonstrate that the long surface lifetime of Bi_2Te_2Se-nanowires allows to access the surface states by a pulsed photoconduction scheme and that there is a prevailing bolometric response of the surface states. The interplay of the surface state dynamics on the different timescales gives rise to a surprising physical property of Bi_2Te_2Se-nanowires: their pulsed photoconductance changes polarity as a function of laser power. Moreover, we show that single Bi_2Te_2Se-nanowires can be used as THz-generators for on-chip high-frequency circuits at room temperature. Our results open the avenue for single Bi_2Te_2Se-nanowires as active modules in optoelectronic high-frequency and THz-circuits.

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