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Polarization dependence of ultrafast dynamics in single Si nanowires M.A. SEO, S.A. DAYEH, P.C. UPADHYA, S.T. PICRAUX, Los Alamos National Laboratory, USA, J. MARTINEZ, B.S. SWARTZENTRUBER, Sandia National Laboratory, USA, A.J. TAYLOR, R.P. PRASANKUMAR, Los Alamos National Laboratory, USA — Understanding how light interacts with individual nanowires (NWs), particularly depending on its polarization with respect to the NW alignment, is essential for a wide range of applications. We present the first ultrafast time-resolved, polarization-dependent experiments on both single- and ensemble-silicon nanowires using non-degenerate pump-probe spectroscopy to excite and probe carriers above the indirect band gap. Polarization sensitive pump-probe excitation and detection reveal a clear anisotropy in the ultrafast dynamics measured parallel and perpendicular to the long axis of a single nanowire. In addition, the magnitude of the photoinduced change in ensembles of NWs varies for four different sets of pump and probe polarization, without an anisotropy in relaxation time. The comparison of ultrafast dynamics between single and ensemble nanowires provides great insight into the influence of incident light polarization on different absorption and interaction mechanisms. The observed anisotropy in single NWs could enable advanced applications, such as optical switching and polarization sensitive photo detection, on the nanoscale, where directional control and high spatial resolution are much desired

M. A. Seo
Los Alamos National Laboratory

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