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Scanning Photoconductivity Measurements on Silicon Nanowire FETs YEONGHWAN AHN, JAMES DUNNING, JIWOONG PARK[1], The Rowland Institute at Harvard, 100 Edwin H. Land Blvd., Cambridge, MA 02142 — Optical studies on single nanowires have been of great interest thanks to their potential applications in nanoscale optoelectronics. Here we report optical scanning measurements on photoconductivity of individual Si nanowires (SiNWs) that are fabricated using CVD-grown SiNWs with diameters of 20-30 nm. Their conductance was then monitored while a laser beam (532 nm) was focused on them and raster-scanned by a conventional optical scanning microscope setup. We observe increases in the conductance for more than two orders of magnitude (light intensity $\sim$ 10 kW/cm^2) and large polarization anisotropy of 0.9, making the SiNW FET a polarization sensitive, nm-sized light detector. In addition, scanning images of photocurrent at various biases reveal the local energy band profile especially near the electrode contacts. The magnitude and polarity of the photocurrent change depending on gate bias, which can be explained using the depletion band flattening and the conduction mode change in SiNWs. Our results demonstrate that this technique is a powerful tool for studying photo-sensitive nanoscale devices.

[1]park@rowland.harvard.edu

Yeonghwan Ahn
The Rowland Institute at Harvard,
100 Edwin H. Land Blvd.,
Cambridge, MA 02142

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