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Long Minority Carrier Diffusion Lengths in Bridged Silicon Nanowires[1] DONG YU, MARK TRIPLETT, YIMING YANG, UC Davis, FRANCOIS LEONARD, ALEC TALIN, Sandia National Lab, SAIF ISLAM, UC Davis — Nanowires have large surface areas which create new challenges for their optoelectronic applications. Lithographic processes involved in device fabrication and substrate interfaces can lead to surface defects and substantially reduce charge carrier lifetimes and diffusion lengths. Here, we show that using a bridging method to suspend pristine nanowires allows for circumventing detrimental fabrication steps and interfacial effects associated with planar device architectures. We report electron diffusion lengths up to 2.7 μm in bridged silicon nanowire devices, much longer than previously reported values for silicon nanowires with a diameter of 100 nm. Strikingly, electron diffusion lengths are reduced to only 45 nm in planar devices incorporating nanowires grown under the same conditions. The highly scalable and low-cost silicon nano-bridge devices with the demonstrated long diffusion lengths may find exciting applications in photovoltaics, image sensing and photodetectors.

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