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Electronic Transport Properties of Silicon-germanium Nanowires

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Abstract content
   (Max 300 words)

Silicon (Si) –germanium (Ge) nanowire field effect transistors (SGNWFET) are important semiconductor devices. Si/SiGe can be used in many different ways to improve conventional nanoelectronic devices. Further research on the synthesis and fabrication of SiGe is needed for the use of SiGe in field effect transistors for exploring the different ways that conventional nanoelectronic devices can be improved. Germanium, being a low bandgap material, increases the conductivity of Si nanowires and may improve the transport properties. In this work we study the electronic transport properties of SiGe nanowires at low temperatures and high frequencies. Silicon-Germanium nano-wires have been synthesized through the laser ablation of a target composed of Si and Ge using Ni as a catalyst. Characterization in the form of Raman spectroscopy as well as transmission electron, scanning electron and atomic force microscopy was performed. Low temperature transport measurements were performed to determine the transport mechanism. This work can be extended to high frequency transport (up to 67 GHz) in the co-planer waveguide configuration. In 1-D nanowires, confinement of charge carriers can generate interesting quantum transport features, such as Coulomb blockade effects and Luttinger liquid behavior. In addition, at high frequencies ballistic transport might be observed. Beyond the rich physics of correlations in low dimensional systems, this work may inform the development of novel electronic devices such as molecular level sensing and solar energy harvesting.

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