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Synthesis and Characterization of Templated Si-based Nanowires via Vapor-liquid-solid (VLS) Growth for Electrical Transport JAE HO LEE, ISAAC LUND, YONGQIANG XUE, ERIC EISENBRAUN, ROBERT GEER, University at Albany- State University of New York — Silicon nanowires have attracted substantial attention for a variety of nanoelectronic and optoelectronic applications. Recent research has demonstrated excellent conductance and conductance scaling in NiSi nanowires further highlighting the potential applicability for SiNW-based systems. In this paper, we report investigations of controlled growth of VLS-grown SiNWs as templates for the surface formation of metal silicide to investigate confinement of electron transport at the nanowire surface by analyzing compositional and electrical characterization. Conduction channel formation utilized W and Ni silicidation. TEM analysis confirmed VLS SiNWs is crystalline. Ni evaporation and Ni and W atomic layer deposition (ALD) and post-deposition thermal processing were carried out for silicide formation. TEM-EDS results showed that ALD W was conformally deposited on the surface of SiNWs. In contrast, e-beam evaporated Ni was asymmetrically deposited on the template nanowire although the resultant silicide was nearly symmetric. Conformal Ni deposition and silicidation was successfully performed, however, using Ni ALD processing. Silicide nanowires were exhibited an improvement in electrical conductivity of eight orders of magnitude compared with that of as-grown VLS SiNWs.

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