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Effect of atomic defects and interwire coupling on the electronic properties of one-dimensional Gd silicide nanowires SHENGYONG QIN, TAE-HWAN KIM, ARTHUR P. BADDORF, AN-PING LI, Center for Nanophase Materials Sciences, Oak Ridge National Laboratory, HANNO H. WEITERING, Department of Physics and Astronomy, The University of Tennessee, Knoxville, CHIH-KANG SHIH, Department of Physics, The University of Texas at Austin, WENJIE OUYANG, YANNING ZHANG, RUQIAN WU, Department of Physics and Astronomy, University of California, Irvine — Metallic nanowires have attracted great interest for understanding the electronic interactions and conductivity in one dimension. Electron transport is often dictated by quantum instabilities and strong localization at low temperature. Well-ordered and uniformly oriented GdSi2 nanowires are self-assembled on Si(100) in the form of either isolated nanowires or wire bundles with atomic interwire spacing. The effects of interwire coupling and atomic defects in these quasi-one-dimensional systems are studied by correlating the 4-probe STM electrical transport with STM local density of states of individual nanowires. While the isolated nanowires exhibit a metal-insulator transition associated with atomic defects, the wire bundles remain metallic at low temperature which we believe the interwire coupling suppress the lattice disorder and stabilize a robust metallic conductance. This research at ORNL's CNMS was sponsored by the Scientific User Facilities Division, Office of BES, U.S. DOE.

Shengyong Qin
Center for Nanophase Materials Sciences, Oak Ridge National Laboratory

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