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Quantum confinement between self-organized Pt nanowires on Ge(001) NURI ONCEL, ARIE VAN HOUSELT, JEROEN HUIJBEN, WOUTER J. VAN BEEK, ANN SOFIE HALLBÄCK, HAROLD J.W. ZANDVLIET, BENE POELSEMA, University of Twente, MESA+ Institute for Nanotechnology, Solid State Physics Group — Annealing of Pt covered Ge(001) surface leads to formation of one atom thick, hundreds of nanometers long, literally defect free chains of Pt atoms, hereafter named as Pt nanowires. By using scanning tunneling spectroscopy (STS) we have discovered one dimensional (1D) electronic states, confined between these Pt nanowires. The nanowires are separated by either 1.6 or 2.4 nm. The Pt atoms create a potential barrier for the surface state electrons on modified Ge-terraces located just below the Fermi level. The peak positions obtained from I-V spectroscopy experiments are in good agreement with the eigenvalues of a quantum mechanical particle in box problem. The spatial mapping of the differential conductivity of the 1D states reveals that the states are confined in the troughs between the nanowires. As an additional proof, we performed careful analysis of the regions, where either the nanowires or the underlying substrate have defects. This analysis clearly shows that the confined states around the defect sites fade away, i.e. the electron states "leak" out of the trough via the defects.

Nuri Oncel

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