Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Ag nanowires on Cu(110) and Ni(110): atomic structure and electronic dimensionality[1] RICHARD KURTZ, PHILLIP SPRUNGER, WEICHANG ZHAO, YAROSLAV LOSOVYI, Louisiana State University — Epitaxial Ag nanowires have been found to self-assemble on Cu(110) or on Ni(110) at Ag coverages exceeding 1.2 ML. The atomic and electronic structure of these nanowires have been characterized by scanning tunneling microscopy (STM) and angle-resolved photoemission spectroscopy (ARPES). STM shows that the Ag(110)-oriented nanowires that are straight and parallel to the [110] direction with a uniform width (height) ranging between 10-30 nm (2-3 nm) depending on coverage. The nanowires have a triangular cross-section and expose two sides of facets that slope at an angle of approx 25 deg with respect to the surface. Overall length-to-width aspect ratios up to 20:1 have been observed. The substrate-wire lattice mismatch induces an anisotropy in the nanowire with a strained lattice match in the [001] (across-wire) direction and an incommensurate periodicity, essentially decoupled from the substrate, in the [110] (along-wire) direction. Angle-resolved photoemission data reveals Ag d-band dispersion in the vertical (or (110)) and the lateral [110] (or along-wire) direction, but absence of dispersion in the lateral [001] (or across-wire) direction because of the limited dimension of the nanowire width. This anisotropic electronic dimensionality correlates with the structural asymmetry.

[1]Funding through NSF-0504654 & LA BoR

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Date submitted: 06 Dec 2005 Electronic form version 1.4