Abstract Submitted
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Intrinsic vacancy induced nanoscale wire structure in heteroepitaxial Ga_2Se_3/Si(001)[1] T. OHTA[2], D. S. SCHMIDT[3], A. KLUST[4], S. MENG[5], Q. YU, M. A. OLMSTEAD, F. S. OHUCHI, U. of Washington, Seattle — A highly anisotropic growth morphology is found for heteroepitaxial gallium sesquiselenide (Ga_2Se_3) on the lattice matched substrate, arsenic-terminated Si(001). This anisotropic, nanowire structure is attributed to surface coalescence of the intrinsic vacancies in β-Ga_2Se_3, a defected zinc-blende semiconductor with every third Ga site vacant. Scanning tunneling microscopy of Ga_2Se_3 films reveals nanoscale, wire-like structures covering the surface in parallel lines, less than 1 nm wide and up to 30 nm long. Core-level photoemission spectroscopy and diffraction reveals the local structure of buried Ga and Se atoms to reflect bulk β-Ga_2Se_3, which contains ordered $\langle 110 \rangle$ arrays of Ga vacancies. The semiconducting, passivated wires form perpendicular to the underlying As-dimer rows of the Si(001):As substrate, and continue to lie in the same direction, with bilayer height differences, as the film grows thicker.

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[3]Supported by UW-PNNL Joint Institute for Nanoscience
[4]Current Address: Stanford University, Stanford, CA
[5]Current Address: Micron Technologies, Inc., Boise, ID

Marjorie Olmstead
U. of Washington, Seattle

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