Morphology of Epitaxial Core-Shell Nanowires
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Epitaxial core-shell nanowires are of great interest because they exhibit an impressive array of novel, tunable optoelectronic properties. When a lattice mismatched shell is grown on a cylindrical core the wires do not always remain cylindrical (a), but can develop nanoscale surface modulations (b) that self-organize into epitaxial quantum dots (c). In a recent Nano Letters article, Wang, Upmanyu, and Ciobanu used an isotropic continuum model to demonstrate that geometric parameters such as core radius and shell thickness play a crucial role in determining whether or not the nanowires remain cylindrical (d). Additional support provided by the DOE Computational Materials Science Network and the NSF Nanoscale Science and Engineering Center at Northeastern University.

For the modeled Si/Ge nanowire, the highest growth rate occurs for a shell with a helical nanoscale surface modulation.