Coexistence of Vapor–Liquid–Solid and Vapor–Solid–Solid Growth Modes in Pd-Assisted InAs Nanowires

Stefan Heun

NEST, Istituto Nanoscienze-CNR and Scuola Normale Superiore
Piazza San Silvestro 12, 56127 Pisa, Italy

We report the Pd-assisted chemical beam epitaxy growth of zinc blende InAs nanowires which are grown on InAs(111)A substrates by employing Pd octane- and hexadecyl-thiolates as catalyst precursors. The structural properties of these nanowires are investigated by scanning and transmission electron microscopy. Furthermore, we demostrate the growth of InAs nanowires on patterned substrates by employing the Pd hexadecylthiolate precursors as a direct-write resist in electron beam lithography [1].

During the growth of InAs nanowires from Pd catalyst particles on InAs(111)A, two distinct classes of nanowires are observed with smooth or zigzagged sidewalls. We show that this is related to a bimodal distribution of the wire-tip diameter: above a critical diameter wires grow with smooth sidewalls, and below with zigzagged morphology. Transmission electron microscopy analysis shows that the catalyst particles at the tip of zigzagged wires are smooth and have a higher aspect ratio than those at the tip of smooth wires. Zigzagged wires grow from liquid particles in the vapor–liquid–solid (VLS) mode whereas the smooth ones grow from solid particles in the vapor–solid–solid (VSS) mode [2].

References:

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[2] Stefan Heun, Boya Radha, Daniele Ercolani, Giridhar U. Kulkarni, Francesca Rossi, Vincenzo Grillo, Giancarlo Salviati, Fabio Beltram, and Lucia Sorba: *Coexistence of Vapor–Liquid–Solid and Vapor–Solid–Solid Growth Modes in Pd-Assisted InAs Nanowires*, Small **6** (2010) 1935.