

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

**S. Heun**<sup>1</sup>, B. Radha<sup>2</sup>, D. Ercolani<sup>1</sup>, G. U. Kulkarni<sup>2</sup>, F. Rossi<sup>3</sup>, V. Grillo<sup>3,4</sup>, G. Salviati<sup>3</sup>, F. Beltram<sup>1</sup>, and L. Sorba<sup>1</sup>

<sup>1</sup>*NEST, Istituto Nanoscienze-CNR and Scuola Normale Superiore, I-56127 Pisa, Italy*

<sup>2</sup>*Jawaharlal Nehru Centre for Advanced Scientific Research, Jakkur, Bangalore 560 064, India*

<sup>3</sup>*IMEM-CNR, Parco Area delle Scienze 37/A, I-43010 Parma, Italy*

<sup>4</sup>*Centro S3, Istituto Nanoscienze-CNR, Via Campi 213A, I-41125 Modena, Italy*

*Presenter's telephone, fax and e-mail address: +39050509472, +39050509417, stefan.heun@sns.it*

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 hexadecane-thiolates as catalyst precursors. The structural properties of these nanowires are investigated by scanning and transmission electron microscopy. Furthermore, we demonstrate 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].

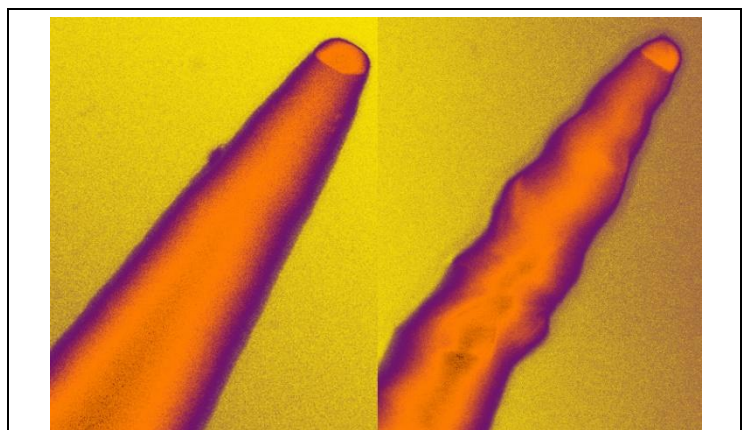
## References:

- [1] S. Heun, B. Radha, D. Ercolani, G. U. Kulkarni, F. Rossi, V. Grillo, G. Salviati, F. Beltram, and L. Sorba: *Pd-Assisted Growth of InAs Nanowires*, *Crystal Growth & Design* **10** (2010) 4197.
- [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.

## Please indicate your preference here:

Oral Presentation (  )

Poster Presentation (  )



**Figure 1.** HAADF images of typical wires with smooth (left) and zigzagged (right) side walls, viewed along the  $[2 -1 -1]$  beam direction.