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EINLADUNG

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CPG Vortrag von

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Selective growth of single walled carbon nanotubes: thermodynamics versus kinetics

am

Dienstag, 18. Mai 2021, um 5:30 PM

Zoom-Meeting beitreten:
https://tuwien.zoom.us/j/98394944839?pwd=MXF0S25nTWttTTUrYnBOemZZbmdqZz09
Meeting-ID: 983 9494 4839- Passwort: g0v3dh5q

Abstract

In classical crystal growth, the interaction of the growing object with its support and the energies of the different facets determine the growth mode and the resulting crystalline structures. The synthesis of carbon nanotubes by chemical vapor deposition poses somewhat similar yet more complex issues. The catalytic particle is both a support and a reactive interface with the growing tube, and many properties are altered because of the nanometric size of the objects. With this in mind, we have identified different growth modes driven by the thermodynamic properties of the interface [1, 2] and developed a model of the interface [3], emphasizing the importance of the configurational entropy of the nanotube edge to stabilize chiral tube and to account for the temperature dependence of tube helicity distributions. This simple lattice model is pushed further to account for more general interface structures and kinetic Monte Carlo simulations are developed to study the growth mechanisms and kinetics, and analyze growth rates in relation with the chiral selectivity of the synthesis.

We also present new in situ measurements of the growth rates of individual CNTs by homodyne polarization microscopy [4] with better time resolution and statistics than previous studies (e.g. [5]). Growth patterns turn out to be more complex than previously thought, displaying growth instabilities that will be discussed.

References

[1] Fiawoo M.-F. C. et al., Phys. Rev. Lett. 108, 195503 (2012).
[2] He M. et al., Nanoscale 10, 6744, (2018)
[3] Magnin Y. et al., Science 362, 212–215 (2018)
[4] Pimonov V., …., Bichara C. and Jourdain V., submitted
[5] Koyano B. et al., Carbon 155, 635–642 (2019)