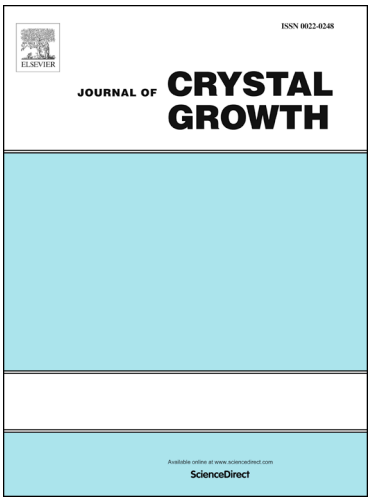

Theoretical analysis of the axial growth of nanowires starting with a binary **eutectic droplet** via vapor-liquid-solid mechanism

Qing Liu, Hejun Li, Yulei Zhang, Zhigang Zhao

PII: S0022-0248(18)30143-X
DOI: https://doi.org/10.1016/j.jcrysgro.2018.03.031
Reference: CRYS 24539

To appear in: *Journal of Crystal Growth*

Received Date: 21 October 2017
Revised Date: 19 March 2018
Accepted Date: 20 March 2018

Please cite this article as: Q. Liu, H. Li, Y. Zhang, Z. Zhao, Theoretical analysis of the axial growth of nanowires starting with a binary **eutectic droplet** via vapor-liquid-solid mechanism, *Journal of Crystal Growth* (2018), doi: https://doi.org/10.1016/j.jcrysgro.2018.03.031

Theoretical analysis of the axial growth of nanowires starting with a binary **eutectic droplet** via vapor-liquid-solid mechanism

Qing Liu, Hejun Li*, Yulei Zhang*, Zhigang Zhao

State Key Laboratory of Solidification Processing, Carbon/Carbon Composites Technology Research Center, Northwestern Polytechnical University, Xi'an 710072, PR China

A series of theoretical analysis is carried out for the axial vapor-liquid-solid (VLS) growth of nanowires starting with a **binary eutectic droplet.** The growth model **considering** the entire process of axial VLS growth is a development of the approaches already developed by previous studies. In this model, the steady and unsteady state growth are considered both. The amount of solute species in a variable liquid droplet, the nanowire length, radius, growth rate and all other parameters during the entire axial growth process are treated as functions of growth time. The model provides theoretical predictions for the formation of nanowire shape, the length-radius and growth rate-radius dependences. It is also suggested by the model that the initial growth of single nanowire is significantly affected by Gibbs-Thompson effect due to the shape change. The model was applied on predictions of available experimental data of Si and Ge nanowires grown from Au-Si and Au-Ge systems respectively reported by **other** works. The calculations with the proposed model are in satisfactory agreement with the experimental results of the previous works.

Keywords: Nanowire; Eutectic; Thermodynamic modeling; Growth kinetics; Size dependence.