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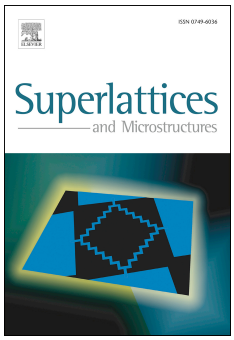

Scaling analysis of Self-assembled structures and related morphological information in epitaxial growth

Sonia Blel, Ajmi B.H. Hammouda, Brahim Mahjoub, Philip Hoggan, Brahim Oujia

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Scaling analysis of Self-assembled structures and related morphological information in epitaxial growth

Sonia Blel[a],*, Ajmi BH.Hammouda[a], Brahim Mahjoub[a], Philip Hoggan[b] , Brahim Oujia[a]

[a]*Quantum Physics Laboratory, University ofMonastir, Monastir 5019, Tunisia*

[b]*Institut Pascal, UMR 6602 CNRS, Campus Universitaire,63178 AUBIERE cedex, France*

Abstract

Using kinetic Monte-Carlo simulations, we have performed a qualitative and quantitative study of the homo-epitaxial growth for two materials Cu and Ag. Based on their dynamic scaling properties, a relationship between the resultant growth morphology and its computed scaling exponents is found to play a key role in the surface self-assembled at long time (hundreds of monolayer) and also at early time (sub-monolayer regime) of growth. Then, the effect of next-nearest-neighbor (NNN) interactions on the scaling exponents, as well as the surface morphology, is discussed. NNN interactions are found to affect the scaling exponents in the case of Cu rather than Ag. We also show that the higher the local roughness, the best 1-D nanostructures are obtained; which is confirmed by the measurement of filling rate of nanowires at step-edge on vicinal surfaces. Our results were compared to the available experimental and theoretical results and seem advantageous for a better understanding of the growth dynamics.

Keywords: Scaling exponents; Nanowires; NNN interactions; Growth morphology; Surface roughness.

***Corresponding author.**

E–mail address: sonia_blel@yahoo.fr (Sonia Blel)