

Supporting information for

Step-edge induced area selective growth: A kinetic Monte Carlo study

Heng Zhang,^a Gang Liu,^a Wenchong Wang,^b Lifeng Chi,^b Shiling Yuan^{a1}

^a School of Chemistry and Chemical Engineering, Shandong University, Jinan 250199, P. R. China

^b Physikalisches Institut, Westfälische Wilhelms-Universität Münster, Wilhelm-Klemm-Str. 10, Münster 48149, Germany

Experiment

The patterns were generated by electron-beam lithography (EBL) on heavily doped Si (100) with 300nm of thermally grown oxide. After EBL, the substrates were coated with 4 nm of a Cr adhesion layer and an Au layer by thermal evaporation. After the sequential, ultrasonic lift-off process and cleaning in chloroform, acetone, ethanol and deionized water, the pre-patterned substrates were introduced into an ultra-high vacuum (UHV) and degassed. The organic molecules were sublimed from a quartz crucible and deposited on the substrate. The substrate temperature and growth rate is 170 °C and 1 nm/min.

Simulation

An additional deposition simulation was conducted providing a compare with the step-edge induced area selective growth. In the simulation, the height of Au patterns was set to zero with other interaction parameters unchanged. At the end of the deposition, most of the deposited particles nucleated above the patterns for high affinity as shown in Fig. S2. The relatively high binding energy between deposited particle and patterns slowed down their diffusion and increased the nucleation probability.

¹ Corresponding authors: Fax: +86 531 88365896 E-mail address: shilingyuan@sdu.edu.cn (S. Yuan)

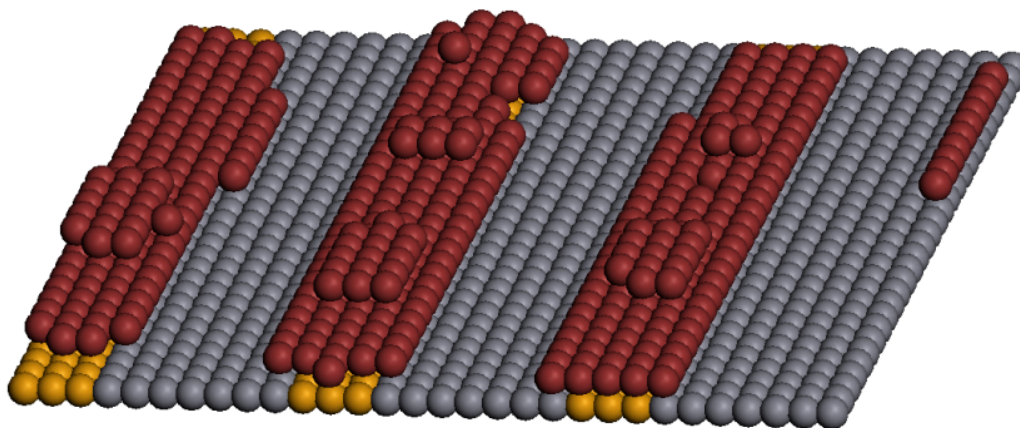


Fig. S1. The snapshot of deposition configuration with deposited particles nucleated above the patterns.

Comparing with binding energy induced selective growth, the step edges of patterns served as the preferential nucleation site in step-edge induced selective growth. The particles near the step-edge areas can interact with both the pattern and the substrate which will dramatically slow down their diffusion. Interacting with more neighbors resulted in a low hop rate. Finally the deposited particles attached with the step-edges serving as new nucleation sites.