

# Kinetics and elasticity in the homoepitaxy on a vicinal Si (001) surface

Wei Hong, Zhenyu Zhang and Zhigang Suo\*

*Division of Engineering and Applied Sciences, Harvard University, Cambridge, MA 02138*

\* [suo@deas.harvard.edu](mailto:suo@deas.harvard.edu)

## ABSTRACT

A vicinal Si (001) surface may form stripes of terraces, separated by monolayer steps of two types,  $S_A$  and  $S_B$ . The neighboring steps repel each other due to an elastic interaction, and in equilibrium the steps are equally spaced. The two types of steps have dissimilar atomic structures, and during homoepitaxy  $S_A$  is less mobile than  $S_B$ . We model the interplay of these elastic and kinetic effects. To account for existing experimental observations, we require that adatoms from both sides of step  $S_A$  have high attachment barriers. Our model predicts that during homoepitaxy all the steps may move in a steady state, such that alternating terraces have constant, but unequal, widths. We study the stability of the steady state using a linear perturbation analysis and numerical simulation.