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Abstract

A surface below its roughening temperature consisting of two dimensional concentric circular monoatomic steps is discussed under step-flow model. Both repulsive and attractive interactions between steps are considered where they vary as r^{-2} and r^{-1} respectively where r is the terrace width between steps. The diffusion equation is solved in two dimensional polar coordinates with the assumption that the local mass transfer occurs due to surface diffusion only during the evolution of the initial surface. The evolution of an initial surface which has a regular cone shape is considered. The morphology and the evolution of the height of surface as a function of time are analyzed in diffusion limited (DL) regime. While in the case of only repulsive interaction between steps surface evolves properly, when both repulsive and attractive interactions between steps are taken into account step bunchings seperated by large flat terraces occur on the surface for some parameter values that depend on the relative strength of attractive and repulsive step interactions and the line tension of circular steps. A phase diagram separating the step bunching and no step bunching regions in parameter space is also obtained.

Keywords:

A1.Crystal morphology, A1.Diffusion, A1.Mass transfer, A1.Surface structure, A1.Surface processes, B2.Semiconducting materials

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