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Step crowding effects dampen the stochasticity of crystal growth kinetics

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Abstract-

Crystals grow by laying down new layers of material which can either correspond in size to the height of one unit cell (elementary steps) or multiple unit cells (macrosteps). Surprisingly, experiments have shown that macrosteps can grow under conditions of low supersaturation and high impurity density such that elementary step growth is completely arrested. We use atomistic simulations to show that this is due to two effects: the fact that the additional layers bias fluctuations in the position of the bottom layer towards growth and by a transition, as step height increases, from a 2D to a 3D nucleation mechanism.

Index Terms-

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