

Abstract Submitted
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The early stages of sidebranching in dendritic crystal growth.

ANDREW DOUGHERTY, THOMAS NUNNALLY, Dept. of Physics, Lafayette College — We report an experimental study of the early stages of sidebranching in the dendritic crystal growth of NH_4Cl crystals in aqueous solution. In steady state, the growing dendrites are characterized by a smooth, nearly parabolic tip. A short distance behind the tip, sidebranches begin to emerge. We characterize the growth of the sidebranches by an envelope $A(z)$, where z is the distance behind the tip. We consider two basic models. In one model, the smooth tip is unstable, and the sidebranches result from the selective amplification of microscopic noise. In this model, $A(z)$ depends on the amplitude of the noise \bar{S} and on various materials parameters. In the second model, the dendrite tip grows in an oscillating mode, with sidebranches emerging like waves in its wake. We have observed no strong oscillations, but very small amplitude ones can not be ruled out. Given the finite experimental resolution, no measurement of the tip region can be completely free of contamination from early sidebranches. We will discuss this and other experimental challenges that need to be overcome before we can understand the origin of sidebranches.

Andrew Dougherty
Dept. of Physics, Lafayette College

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