A delta-function model for three-dimensional axisymmetric crystals

PING DU, HARRIS WONG, Louisiana State University — A surface energy polar plot contains two possible singularities: the cusps that give facets on an equilibrium crystal, and the circular arcs connecting the cusps that can lead to missing orientations. The common approach of specifying the surface energy usually cannot handle both singularities simultaneously. We model the surface stiffness to avoid missing orientations. Furthermore, a facet is represented by the Dirac delta function with the weight of the delta function equal to the width of the facet. Thus, both singularities are treated precisely. This approach has been shown to work for two-dimensional symmetric [1] and axially symmetric [2] crystals. Here, we apply the delta function to model three-dimensional axisymmetric crystals and obtain analytic solutions to the nonlinear differential equation governing the crystal shape. We find that at every point on the crystal surface the chemical potential is equipartitioned between the axial and the azimuthal component.