A geometric Ginzburg-Landau theory — modeling, numerics and applications to thin film growth

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We consider the faceting of thermodynamically unstable crystal surfaces caused by strongly anisotropic surface tension and driven by attachment-detachment mechanisms, surface diffusion and a combination of both. Modeling these phenomena within a continuum framework leads to evolution equations which are ill posed unless an additional energy of edges and corners in included. This in turn leads to the dependence of surface tension on the local curvature. We discuss front tracking, phase field and level set approximations for these curvature regularized geometric evolution equations and numerically analyse the surface evolution under growth.