FORMATION OF FACETS IN AN EQUILIBRIUM MODEL OF SURFACE GROWTH

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We consider an effective equilibrium model which is designed to mimic facets on the Wulff shape for the three dimensional low temperature Ising model. The model consists of a low temperature SOS interface which separates between high and low density co-existing bulk phases modeled by Bernoulli fields on the three-dimensional lattice above and below the interface. The system is confined to a lattice box of linear size N. The interface is pinned at the boundary of the middle section of the box. Facets are created by imposing canonical constraint on the total number of particles in both phases.

It is shown that as the constraint grows, the model undergoes a sequence of first-order transitions which correspond to spontaneous creation of mono-layers of linear size N. The macroscopic shapes of these mono-layers are governed by solutions to a generalized isoperimetric problem. For sufficiently low temperatures the results hold for any fixed number of mono-layers as N tends to infinity. Some partial results on fluctuations of mono-layer boundaries are also obtained.

Joint work with Senya Shlosman