Evaporation/Condensation of Ising Droplets

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Abstract: In Ref. [1] Biskup *et al.* study the behaviour of d-dimensional finite-volume liquid-vapour systems at a fixed excess δN of particles above the ambient gas density. They identify a dimensionless parameter $\Delta(\delta N)$ and a universal constant $\Delta_c(d)$ and show that for $\Delta < \Delta_c$ a droplet of the dense phase occurs while for $\Delta > \Delta_c$ the excess is absorbed in the background. The fraction λ_Δ of excess particles forming the droplet is given explicitly. Furthermore, they state, that the same is true for solid-gas systems.

To verify these results, we have simulated the spin-1/2 Ising model on a square lattice at constant magnetisation equivalent to a fixed particle excess in the lattice-gas picture. We measured the largest minority droplet, corresponding to the solid phase, at various system sizes ($L = 40 \ldots 640$). Using analytic values for the spontaneous magnetisation m_0, the susceptibility χ and interfacial free energy τ_{W} for the infinite system, we were able to determine λ_Δ in very good agreement with the theoretical prediction. In order to test the universal aspects of the evaporation/condensation transition, the measurements were repeated for the next-nearest neighbour interaction and on a triangular lattice, giving similar good results.

Furthermore, we measured the interfacial free energy τ_{W} in good agreement with the analytical value.

[1] M. Biskup, and L. Chayes, and R. Kotecký, Europhys. Lett. **60** (2002) 21.