2d Ferromagnets: Random Anisotropy to the Rescue?

Technologically significant schemes such as delta doping, which seek to render thin layers of semiconducting materials magnetic, are in principle hampered by physics highlighted in the Mermin Wagner Theorem, which precludes a finite temperature ferromagnetic ordering for systems with continuous degrees of freedom; ferromagnetism in systems such as the XY and Heisenberg models on two dimensional lattices is eliminated by spin waves, which may be excited even at low temperatures. Nevertheless, introducing even a slight easy axis anisotropy is very effective in stabilizing ferromagnetic order if the easy axis orientation is uniform. We consider the case of a locally random easy axis anisotropy (e.g. stemming from quenched disorder or more transient thermally excited lattice vibrations), and for various strengths of the anisotropy perturbation, we use Monte Carlo simulations to determine if long range ferromagnetism is supported by the presence of random magnetic anisotropy.