

Seminar

Nematic-columnar phase transition in oriented hard rectangles

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Columnar or smectic order in which there is partial translational order is seen in many different contexts. A common example is the smectic phase in liquid crystals. The prototypical models that show columnar phase are the hard square and hard rectangle lattice gas models. Despite a long history, analytical tools to study the columnar phase are not well-developed. We consider an assembly of monodispersed hard rectangles of size $2 \times d$ on a square lattice. For large enough aspect ratio, it is known that this system undergoes three phase transitions as the density of rectangles is increased: first an isotropic-nematic transition, second a nematic-columnar transition, and third a columnar-sublattice transition. Interestingly, the critical density for the nematic-columnar transition remains finite even as d tends to infinity. We develop a systematic high density expansion for (1) the free energy and (2) the surface tension between two differently-ordered columnar phases. Truncating at few perturbative correction terms, we obtain an estimate that is in excellent agreement with estimates from Monte Carlo simulations, for all d greater than 2.

Monday, Jun 20th 2016

4:00 PM (Tea/Coffee at 3:45 PM)

Seminar Hall, TCIS