Internal Seminar

Re-entrant orientational correlations in a model fluid with quenched disorder

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We present Monte Carlo simulations of a model fluid with quenched disorder in 2-spatial dimensions. The fluid particles interact through an inverse twelfth power potential in a random potential energy landscape that has a Gaussian distribution of energies with zero mean and exponentially decaying short-range correlations [1]. We obtain, for the first time, the disorder-averaged orientational correlations $g_\theta^{(2)}(r)$, an analogue of the Edwards-Anderson order parameter. We find that with disorder, the orientational correlations at large distances, increases in the liquid regime; decreases in the solid regime; and shows a re-entrant behaviour with a critical disorder close to the phase boundary. For translations with disorder [2, 3], we find that the $g_r^{(2)}(r)$, at short distances, increases linearly in all three regimes. With disorder, the structure factor first peak height is roughly constant in the liquid regime, decreases in the solid regime and is flat initially and then decreases close to the phase boundary.

References

[1] E. M. Chudnovsky and R. Dickman, Phys. Rev. B. 57, 2724 (1998).
[2] A. Sengupta, S. Sengupta, and G.I. Menon, Europhys. Lett., 70, 635 (2005).
[3] J. Bewerunge, A. Sengupta, R. F. Capellmann, F. Platten, S. Sengupta, S. U. Egelhaaf, J. Chem. Phys. 145, 044905 (2016).

Friday, Feb 1st 2019

2:30 PM (Tea/Coffee at 2:00 PM)

Seminar Hall, TIFR-H