Fluctuation Relations and Crystallization

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Hard spheres undergo a fluid to solid phase transition if the packing fraction is larger than approx. 0.5. The nucleation process and forming structures are still under investigation. A new approach is to correlate forming structure and dissipation. Fluctuation relations are the method of choice. Increasing the pressure with time results in thermodynamic work, linked by the first law of thermodynamics to dissipation.
Studying fluctuation relations of structural phase transition and even slow dynamics is important. A new kind of fluctuation enters the dynamics that is macroscopic instead of microscopic based on thermal fluctuations.