
Hyperuniformity and Phase Separation in Biased Ensembles of Trajectories for Diffusive Systems

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Abstract

We consider biased ensembles of trajectories for diffusive systems. In trajectories biased either by the total activity or the total current, we use fluctuating hydrodynamics to show that these systems exhibit phase transitions into "hyperuniform" states, where large-wavelength density fluctuations are strongly suppressed [1]. We illustrate this behavior numerically for a system of hard particles in one dimension and we discuss how it appears in simple exclusion processes. We argue that these diffusive systems generically respond very strongly to any nonzero bias, so that homogeneous states with "normal" fluctuations (finite compressibility) exist only when the bias is very weak. Time permitting, we will also discuss the kinds of "effective interaction" that can stabilise these unusual stages under equilibrium conditions.

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