
Cooperativity and laning of driven tracers

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Abstract

Several tracers driven in a dense bath tend to follow each other to increase their mobility, thereby forming lanes. This phenomenon is encountered in suspensions of charged colloids as well as in pedestrian traffic. The nature of this so-called "laning transition" has been debated: is it a crossover or a phase transition? In order to quantify the order in the system, we focus on the correlations between the tracers themselves and between the tracers and the bath. Our analytical approach is based on the linearization of the stochastic equations for the density fields. The correlations are found to be anisotropic and long ranged. Brownian dynamics simulations confirm our results and show that the shape that we predict holds far beyond the validity range of our computation, suggesting that it is universal. Finally, I discuss the model dependence of this behavior.

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