

Dynamics of an inelastic tagged particle under strong confinement

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The dynamics of a tagged particle immersed in a fluid of particles of the same size but different mass is studied when the system is confined between two hard parallel plates separated a distance smaller than twice the diameter of the particles. The collisions between particles are inelastic while the collisions of the particles with the hard walls inject energy in the direction perpendicular to the wall, so that stationary states can be reached in the long-time limit. The velocity distribution of the tagged particle verifies a Boltzmann-Lorentz-like equation that is solved assuming that it is a spatially homogeneous gaussian distribution with two different temperatures (one associated to the motion parallel to the wall and another associated to the perpendicular direction). It is found that the temperature perpendicular to the wall diverges when the tagged particle mass approaches a critical mass from below, while the parallel temperature remains fi-

nite. Molecular Dynamics simulation results agree very well with the theoretical predictions for tagged particle masses below the critical mass. The measurements of the velocity distribution function of the tagged particle confirm that it is gaussian if the mass is not close to the critical mass, while it deviates from gaussianity when approaching the critical mass. Above the critical mass, the velocity distribution function is very far from a gaussian, being the marginal distribution in the perpendicular direction bimodal and with a much larger variance than the one in the parallel direction [1].

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- [1] P. Maynar, M. I. García de Soria, and J. J. Brey, *Dynamics of an inelastic tagged particle under strong confinement*, *Physics of Fluids* **34**, 123321 (2022).