Diffusion of Grains in a Weakly Non-Ideal Dusty Plasmas and in Neutral Systems

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Under usual conditions the stochastic motion of particles leads to a second moment of their space distribution that is linear in time $< r^2(t) > \sim Dt$. Such type of diffusion processes plays a crucial role in plasmas, including dusty plasmas, and neutral systems in various phases. At the same time in many physical, chemical and biological systems deviations from the linear in time dependence of the mean squared displacement have been experimentally observed. The average square separation of a pair of particles in a turbulent flow grows, according to Richardson's law, with the third power of time. For diffusion typical for glasses and related complex systems the observed time dependence is slower than linear. These two types of anomalous diffusion obviously are characterized as superdiffusion and subdiffusion.

The dependence of the diffusion coefficient as a function of the grain-grain interaction parameter Γ is investigated for a weakly interacted dusty plasmas with the charging process. The diffusion coefficient can be increasing or decreasing function of Γ, depending from the characteristic plasma parameters.

The problem of normal and anomalous diffusion is formulated on the basis of integral master-type equations with various probability transition functions for diffusion in coordinate space (PTD functions). The general relations for the mean-squared displacements are found.

1. S.A. Trigger, G.J.F. van Heijst and P.P.J.M. Schram 2005 *J.Phys. Conference Series* **11**, 37

2. S.A. Trigger, G.J.F. van Heijst and P.P.J.M. Schram 2005 *Physica A* **347**, 77