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# Effects of Electric Field on Diffusion Coefficients and Share Viscosity in Dusty Plasmas

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**Abstract :** Dusty (complex) plasmas contained micro-sized charged dust particles in addition to ions, electrons, and neutrals. It is typically low-temperature plasma and exists in a wide variety of physical systems. In this work, the effects of an external electric field on the diffusion coefficient and share viscosity are investigated through equilibrium molecular dynamics (EMD) simulations in three-dimensional (3D) strongly coupled (SC) dusty plasmas (DPs). The effects of constant and varying normalized electric field strength (E*) have been computed along with different combinations of plasma states on the diffusion of dust particles using EMD simulations. Diffusion coefficient (D) and share viscosity (η) along with varied system sizes, in the limit of varying E* values, is accounted for an appropriate range of plasma coupling (Γ) and screening strength (κ) parameters. At varying E* values, it is revealed that the 3D diffusion coefficient increases with increasing E* and κ; however, it decreases with an increase of Γ but within statistical limits. The share viscosity increases with increasing E*and Γ and decreases with increasing κ. New simulation results are outstanding that the combined effects of electric field and screening strengths give well-matched values of Dandη at low-intermediate to large Γ with varying small-intermediate to large N. The current EMD simulation outcomes under varying electric field strengths are in satisfactory well-matched with previous known simulation data of EMD simulations of the SC-DPs. It has been shown that the present EMD simulation data enlarged the range of E* strength up to 0.1 ≤ E*≤ 1.0 in order to find the linear range of the DPs system and to demonstrate the fundamental nature of electric field linearity of 3D SC-DPs.

**Keywords :** strongly coupled dusty plasma, diffusion coefficient, share viscosity, molecular dynamics simulation, electric field strength
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