Kolmogorov–Sinai and configuration entropy in dusty plasma model

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The thermodynamics (entropy and thermostat model), statistical physics, concepts of equilibrium and partial equilibrium are crucial for dusty plasma description. The problem of estimation of dusty plasma entropy is under consideration. All approaches of this research are based on analytical and theoretical approach, and also on molecular dynamics simulation of dusty plasma system.

The divergence of trajectories of dusty plasma model system allows to calculate K-entropy (Krylov-Kolmogorov-Sinai entropy). The value of K is also equal to averaged maximum Lyapunov exponent and entropy growth rate since reciprocal is an important relaxation time. Furthermore, predictability time is studied. This time characterizes the time interval, during this interval future behavior of a dynamic system based on the initial conditions and deterministic dynamical equations can be predicted. The configuration entropy is compared with K-entropy.

The time of trajectories divergence in the molecular dynamics simulation might be different in different directions, so the partial equilibrium subsystem can be observed in the system. Estimations for the characteristic time of divergence if different directions of dust particles motion are obtained. The method for entropy is estimated for conditions of standard laboratory experiment on dusty plasma. The applicability of the thermodynamic functions for the description of plasma-dust system is discussed.