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Structures and Dynamics of a Two-Dimensional Confined Dusty Plasma System

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Abstract: The influence of the confining potential strength and temperature on the structures and dynamics of a two-dimensional (2D) dusty plasma system is investigated through molecular dynamic (MD) simulation. The circular symmetric confining potential leads to the nonuniform packing of particles, that is, an inner core with a hexagon lattice surrounded by a few outer circular shells. Under the appropriate confining potential and temperature, the particle trajectories on middle shells form a series of concentric and nested hexagons due to tangential movements of particles. Mean square displacement, self-diffusion constant, pair correlation function, and the nearest bond are used to characterize the structural and dynamical properties of the system. With the increase of the confining potential, the radial and tangential movements of particles have different behaviors. With the increase of temperature, the radial and tangential motions strengthen, particle trajectories gradually become disordered, and the system gradually changes from a crystal or liquid state to a gas state.

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