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Phase Transitions, Structures and Transport of Charged Dust in Plasma under Laboratory and Microgravity Conditions[1] OLEG PETROV, Joint Institute for High Temperatures RAS — The charged dust system represent a non-neutral or quasi-neutral systems (dusty plasmas) containing micron-sized particles of a substance with electrical charges up to 1000-10000 e. As a result of strong interaction, the dust particles may form the ordered structures of liquid and crystal types. The laboratory dusty plasma is the unique object for studying the structures, phase transitions and transport phenomena on the "kinetic level." The phase transitions in quasi-two-dimensional dust structures suspended in rf discharge were studied. The experimental results have revealed the existence of hexatic phase as well as solid-to-hexatic phase and hexatic-to-liquid transitions. The spatial distribution of pair interparticle interaction forces was recovered by the original method based on solving the inverse problem using Langevin equations. The measured phase-state points with the theoretical phase diagram of two-dimensional Yukawa system have been obtained. The formation of ordered structures from large number (about 10000) of charged diamagnetic dust particles in a cusp magnetic trap was studied under microgravity conditions onboard ISS. The magnetic susceptibility and charge of the particles have been estimated. An experimental study of the kinematic viscosity was carried out for dust particles of different sizes in weakly ionized plasma. Nonmonotonic dependence (a minimum) of the viscosity constants on the coupling parameter has been observed.

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