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Melting scenario for two-dimensional plasma crystals V. NOSENKO, S.K. ZHDANOV, A.V. IVLEV, C.A. KNAPEK, G.E. MORFILL, Max-Planck Institute for Extraterrestrial Physics — A complex, or dusty plasma is an ionized gas containing fine particles of solid matter. These particles acquire a large negative electric charge, and due to mutual interaction and the plasma's naturally present electric fields, they arrange themselves in a regular pattern with crystalline or liquid-like order. In our experiment, polymer microspheres were suspended in the sheath of a rf discharge in argon. They settled in a 2D triangular crystalline lattice. This lattice is very soft and can be readily melted using, e.g. the radiation of a focused laser beam. The particles can be imaged directly, and their positions and velocities calculated. We performed experimental study of melting in 2D crystalline lattices using complex plasma as a model system. We found an Arrhenius dependence of the lattice defect concentration C on the kinetic temperature in steady-state experiments, and show the evidence of metastable quenching in unsteady experiments, where C follows a power-law temperature scaling. In all experiments, independent indicators suggest a grain-boundary-induced melting scenario.

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