Experimental and numerical investigation of structural transitions in a quasi-two-dimensional system of colloidal active particles in plasma

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Calculated results are presented for experimental investigation of structural transitions in a quasi-two-dimensional system of dusty active particles in comparison with numerical investigation of appropriate transitions in model system of passive and active particles. Experiment was carried out with MF (melamine formaldehyde) particles in RF discharge and transitions were observed by increasing laser power. The simulations were performed in LAMMPS (Large-scale Atomic/Molecular Massively Parallel Simulator). The particles affected by the radiometric force were chosen as the model of active particles. In this study, we discuss and compare features of melting the systems under consideration. Various melting criteria are considered, such as the dynamic Lindemann criterion [1], the criterion based on cumulative two-body entropy [2] and the analysis of defect clusters. A significant difference in the melting scenario of active and passive particle systems has been revealed. This work was supported by the Russian Science Foundation (project no. 24-22-00130).

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