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Ion-Streaming Induced Order-Disorder Transition in Multi-Component Dusty Plasmas — •Patrick Ludwig[1], Hanno Kählert[1], Michael Bonitz[1], and James Dufty[2] — [1]Universität Kiel — [2]University of Florida

Dust Dynamics Simulations utilizing a dynamical screening approach are performed to study the effect of ion-streaming on the self-organized structures in a 3D spherically confined complex (dusty) plasma.[1,2] Varying the Mach number M – the ratio of ion drift velocity to the sound velocity, the simulations reproduce the experimentally observed cluster configurations in the two limiting cases: at $M = 0$ strongly correlated crystalline structures consisting of nested spherical shells (Yukawa balls) and, for $M \geq 1$, flow-aligned dust chains, respectively. In addition, our simulations reveal a discontinuous transition between these two limits. It is found that already a moderate ion drift velocity ($M \approx 0.1$) destabilizes the highly ordered Yukawa balls and initiates an abrupt melting transition. The critical value of M is found to be independent of the cluster size. A similar streaming-induced order transition is expected to exist also in unconfined multi-component dusty and quantum plasmas.[3]

[1] Introduction on Complex Plasmas, M. Bonitz, N. Horing, and P. Ludwig (eds.), Springer (2010) [2] P. Ludwig, H. Kählert, and M. Bonitz, submitted to Plas. Phys. Contr. Fus. (2011) [4] P. Ludwig, M. Bonitz, H. Kählert, and J.W. Dufty, J. Phys. Conf. Series **220**, 012003 (2010)

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Email: ludwig@theo-physik.uni-kiel.de