Abstract Submitted
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Coulomb crystallization in two-component quantum plasmas[1] M. BONITZ, Inst. Theoretical Physics and Astrophysics, Univ Kiel, Germany, V.S. FILINOV, P.R. LEVASHOV, V.E. FORTOV, Institute for High Energy Densities, Moscow, Russia, H. FEHSKE, Institut of Physics,University Greifswald, Germany — Coulomb crystallization is a common phenomenon in trapped (non-neutral) plasmas. In a neutral plasma, however, it is hampered by recombination of electrons and ions. Known examples are ion Coulomb crystals in white dwarf and neutron stars. Here, we predict the conditions under which a Coulomb crystal of heavy particles (e.g. ions) can form in the presence of a degenerate delocalized background of light charges (e.g. electrons): the key requirement is the mass ratio has to exceed a critical value of about 80 [1]. This leads to the prediction of novel types of crystals e.g. in hydrogen and helium. Further, we predict that holes in semiconductors can spontaneously order into a regular lattice in materials with sufficiently flat valence bands. A unified phase diagram of Coulomb crystals in two-component systems is derived and verified by first-principe path-integral Monte Carlo simulations [1-3]. [1] M. Bonitz, V.S. Filinov, V.E. Fortov, P. Levashov, H. Fehske, Phys. Rev. Lett. 95, 235006 (2005), Phys. Rev. Focus, Dec 2005 [2] M. Bonitz, V.S. Filinov, V.E. Fortov, P. Levashov, H. Fehske, J. Phys. A: Math. Gen. 39, 4717 (2006) [3] M. Bonitz, V.S. Filinov, V.E. Fortov, P. Levashov, H. Fehske, Phys. Rev. E (2006)

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