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Crystallization in mass and charge asymmetric bilayers MICHAEL BONITZ, PATRICK LUDWIG, ALEXEI FILINOV, Institute for Theoretical Physics and Astrophysics, Kiel University, Germany, YURII LOZOVIK, Institute of Spectroscopy, Russian Acad Sciences, Troitsk, Russia, HEINRICH STOLZ, Inst Physics, Rostock University, Germany — We consider Coulomb crystal formation in quantum electron-ion (hole) bilayers. Varying the mass ratio M of ions and electrons between 1 and 100 for a fixed layer separation d at low temperature and high density, one can tune the hole behavior from delocalized (quantum) to localized (quasi-classical) while the electrons remain delocalized all the time. While in 3D plasmas [1], ions crystallize if the mass ratio exceeds a critical value of $M_{cr} \sim 80$, in bilayers M_{cr} can be drastically reduced by properly choosing d and the in-layer particle density. The complicated overlap of correlation and quantum effects of both, electrons and holes, is fully taken care of by performing first-principle path integral Monte Carlo simulations.

[1] M. Bonitz, V.S. Filinov, V.E. Fortov. P.R. Levashov, and H. Fehske, Phys. Rev. Lett. 95, 235006 (2005) and J. Phys. A: Math. Gen. **39**, 4717 (2006). [2] P. Ludwig, A. Filinov, Yu. Lozovik, H. Stolz, and M. Bonitz, Crystallization in mass-asymmetric electron-hole bilayers, Contrib. Plasma Phys. (2007), ArXiv: cond-mat/0611556

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Michael Bonitz Institute for Theoretical Physics and Astrophysics, Kiel University, Germany

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