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Wigner Supersolid of Excitons in Electron-Hole Bilayers YOGESH JOGLEKAR, IUPUI, ALEXANDER BALATSKY, LANL, SANKAR DAS SARMA, University of Maryland — Bilayer electron-hole systems, where carriers in one layer are electrons and carriers in the other are holes, are expected to undergo Bose-Einstein condensation of excitons when the layer separation d is much smaller than the interparticle distance $r_s a_B$ within each layer. We show, based on general principles, that there are two distinct ground states in this regime. The first, a uniform Bose condensate of excitons, has been studied in the literature. We predict the existence of a second state, a Wigner supersolid of excitons, that occurs in the region $\sqrt{r_s} \leq d/a_B \leq r_s$. In this phase, the excitons are phase coherent but form a Wigner crystal due to dipolar repulsion. We present a qualitative phase diagram of the bilayer system, and discuss properties and possible signatures of the Wigner supersolid phase.

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