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Dipolar superfluidity in electron-hole bilayers YOGESH JOGLEKAR, LANL, ALEXANDER BALATSKY, LANL, PETER LITTLEWOOD, LANL and University of Cambridge — Bilayer electron-hole systems, where the electrons and holes are confined to separate layers and have a very low recombination rate, undergo excitonic condensation when the distance between the layers is smaller than typical distance between particles within a layer. We argue that the excitonic condensate is a novel dipolar superfluid in which the phase of the condensate couples to the *gradient* of the vector potential. We predict the existence of dipolar supercurrent which can be tuned by an in-plane magnetic field and detected by independent contacts to the layers. Thus the dipolar superfluid offers an example of excitonic condensate in which the *composite* nature of its constituent excitons is manifest in the macroscopic superfluid state. We also discuss various properties of this superfluid including the role of vortices, response to time-dependent fields, and the evolution of noise in the in- plane currents (A.V. Balatsky *et al.*, cond-mat.0404033).

Yogesh Joglekar
LANL

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