Exciton supersolidity in hybrid Bose-Fermi systems

MichałMatuszewski¹, Thomas Taylor², and Alexey V. Kavokin²

¹ Instytut Fizyki PAN, Aleja Lotnikó w 32/46, 02-668 Warsaw, Poland
² School of Physics and Astronomy, University of Southampton, Southampton, SO171BJ, United Kingdom

Abstract

We investigate the ground states of a Bose-Einstein condensate of indirect excitons coupled to an electron gas. We show that in a properly designed system, the crossing of a roton minimum into the negative energy domain can result in the appearance of the supersolid phase, charac- terized by periodicity in both real and reciprocal space. Accounting for the spin-dependent exchange interaction of excitons we obtain ferromagnetic supersolid domains. The Fourier spec- tra of excitations of weakly perturbed supersolids show pronounced diffraction maxima which may be detected experimentally.

References

[1] M. Matuszewski, T. Taylor, and A. V. Kavokin, Phys. Rev. Lett. 108, 060401 (2012).