

# Colloquium Notice

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### *Superfluidity in Two-Dimensional Nanomaterials*

A study the formation of a spatially indirect exciton as a pair of an electron and a hole in two layers of gapped graphene, or transition metal dichalcogenide (TMDC), or phosphorene separated by a dielectric is presented. A solution of two-body problem in these systems is discussed. We propose to observe the superfluidity and Bose-Einstein condensation for a quasi-two-dimensional gas of indirect excitons in these quantum heterostructures. The superfluidity of 2D spatially indirect excitons at low densities in TMDC double layers form a two-component weakly interacting gas of A and B excitons. We demonstrate that the mean field critical temperature for a two-component dilute weakly interacting Bose gas of excitons in a TMDC double layer is an increasing function of the factor  $Q$ , determined by the effective reduced mass of A and B excitons. We predict that a weakly interacting gas of dipolar excitons in a double layer of phosphorene exhibits superfluidity and show that the critical velocity of superfluidity, the spectrum of collective excitations and mean field critical temperature for superfluidity are anisotropic and depend on the direction of motion of dipolar excitons.

Monday

**November 27, 2017**

Starts at 12:15 PM

Coffee at 12:00 PM

Physics Conference Room, SB B326