Seminar

Electronic phase transition in charge neutral graphene multilayers: Does graphene ever become graphite upon increasing thickness

Alberto Morpurgo

University of Geneva

Time: 2:00pm, Nov 25, 2019 (Monday)

时间: 2019年11月25日（周一）下午2:00

Venue: w202, Physics building, Peking University

地点：北京大学物理楼，西202报告厅

Abstract

Upon increasing the number of layers, it is expected that the electronic properties of Bernal stacked multilayers should approach those of graphite, which is a semi-metal. Here I will discuss experiments on ultra-clean suspended multilayer graphene devices showing that –at least up to 8 layer Bernal-staked graphene multilayers (8LG)– this is not the case. The experiments show that increasing thickness makes the behavior deviate more from that of graphite. In particular –starting from bilayers- we observe phase transitions occurring in all Bernal stacked multilayers irrespective of whether they are even or odd. The phase transition is such that, at low temperature, all even layers become insulating and all odd layers remains conducting, exhibiting conduction due to an individual Dirac band. We can measure precisely the transition temperature and the gap for all thicknesses up to 7LG. We find that in bilayers T_c = 12 K and D =1.5 meV, and in 7LG T_c = 100 K and D = 12 meV. The behavior of all multilayers –even and odd– is perfectly described by a second order phase transition, in which the order parameter is a staggered potential whose sign alternates from one layer to the next.

About the Speaker

Alberto Morpurgo is a condensed matter physicist, with a broad interest in the electronic properties of materials. He received a Master in Physics from the University of Genova (Italy), and a PhD degree from the University of Groningen (the Netherlands), for his experimental work on mesoscopic physics. In 1998-99, Dr. Morpurgo was postdoc at Stanford University, working on carbon nanotubes, and subsequently moved to Delft University (the Netherlands), where he became associate professor. In Delft, he extended his work on mesoscopic physics, developed a research line on organic semiconductors, and in 2006 he started working on graphene. In 2008, Dr. Morpurgo moved to University of Geneva, Switzerland, as full professor. His current research focuses entirely on 2D materials and van der Waals interfaces, and encompasses a variety of materials and techniques (e.g., ionic liquid gating, optoelectronics, magnetic 2D materials etc.). Dr. Morpurgo is the recipient of the Midema price 2000 for the best Dutch PhD thesis on condensed matter physics in 1998-99. He has authored more than 150 papers, cited more than 14’000 times according to web of science (h=57).