Quantum Emitters in Flatland

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Date: 20 Jun 2017 (Tuesday)  
Time: 2.00pm to 3.00pm  
Venue: Hilbert Space (PAP-02-02)  
Host: Gao Weibo

Abstract

Engineering solid state quantum systems is amongst grand challenges in engineering quantum information processing systems. While several 3D systems (such as diamond, silicon carbide, zinc oxide) have been thoroughly studied, solid state emitters in two dimensional (2D) materials have not been observed. 2D materials are becoming major players in modern nanophotonics technologies and engineering quantum emitters in these systems is a vital goal.

In this talk I will discuss the recently discovered single photon emitters in 2D hexagonal boron nitride (hBN). I will present several avenues to engineer these emitters in large exfoliated sheets using ion and electron beam techniques. Density functional theory calculations suggest that the studied defects are the antisite nitrogen vacancy in hBN. The formed emitters in 2D hBN flakes have extremely promising properties – including high brightness (~ millions counts/s), stability up to high temperatures and linear polarization at excitation and absorption. Those properties make these emitters extremely attractive for their integration with optical resonators and waveguides. Finally, I will discuss several challenges and promising directions in the field of quantum emitters and nanophotonics with 2D materials and other wide band gap materials.

Short Biography

Igor Aharonovich received his PhD in 2010 from the University of Melbourne and spent two years in Harvard as a postdoctoral researcher. In 2013 Igor returned to Australia and joined the School of Mathematical and Physical Sciences, University of Technology Sydney (UTS), where he is currently an Associate Professor and the leader of the Nanophotonics laboratory.

Igor’s group is focusing on exploring single emitters in wide band gap semiconductors, and their implementation in quantum technologies and bio-medical applications. His group is also interested in innovative approaches for nanofabrication of nanophotonics devices for low threshold lasing and energy efficient light sources.

Igor is a recipient of the ARC DECRA (2013), the Geoff Opat Early Career Researcher Prize (2013), the New South Wales Young Tall Poppy Award (2015), the IEEE Young Investigator Award (2016, honors an individual who has made outstanding technical contributions to photonics prior to 35th birthday) and the 2017 Pawsey medal from the Australian Academy of Science.