Novel two-dimensional van der Waals crystals and heterostructures

A. Patanè
School of Physics and Astronomy
The University of Nottingham, Nottingham NG7 2RD (UK)
amalia.patane@nottingham.ac.uk

The development of van der Waals (vdW) heterostructures made by stacking two dimensional (2D) crystals has led to the discovery of fundamental physical phenomena and to the realization of 2D functional devices ranging from sensitive phototransistors to tunnel diodes. The electronic properties of these devices can be modified not only by careful selection of the materials within the stack, but also by adjusting the built-in strain and relative orientation of the component crystalline layers. Among the vdW crystals, the metal chalcogenide InSe compound represents an exfoliable and stable semiconductor that expands the current library of vdW crystals. In this talk I will review the research at Nottingham on this new class of 2D layered compounds. From the growth and fabrication of vdW heterostructures to the demonstration of prototype graphene/InSe devices, I will discuss how these layers can provide a platform for scientific investigations and new routes to 2D electronics and optoelectronics.

Biography

Prof. Amalia Patanè studied at the University of Rome "La Sapienza" where she graduated with first-class honours in Physics in 1994 and a PhD in 1998. She has worked as a Research Associate (1998-2002) in the School of Physics and Astronomy of the University of Nottingham, where she conducted the first imaging by magneto-tunnelling of electrons confined in a nanocrystal (Science 2000). As a lecturer at Nottingham (2002-06), she has developed further her research on quantum systems by exploring novel carrier dynamics in high magnetic fields (Nature 2004). She was promoted Reader in 2006 and Professor of Physics in 2011. Her current research focuses on optical and electrical studies of novel van der Waals two dimensional crystals and heterostructures (Nature Physics 2015; Nature Nanotechnology 2017). Prof. Patanè leads the University of Nottingham in the EU Graphene Flagship (http://graphene-flagship.eu/) and as a member of the Council of the European Magnetic Field Laboratory, EMFL (http://www.emfl.eu/home.html), she promotes the development of high magnetic field facilities and their application to study important materials in condensed matter physics. Her research achievements were recognized by the Sir Charles Vernon Boys Medal and Prize of the Institute of Physics (2007), an EPSRC Advanced Research Fellowship (2004-09) and a Leverhulme Trust Research Fellowship (2017-19). She is also a Member of the International Union of Pure and Applied Physics Commission (IUPAP, Semiconductor Commission 2014-20) and the Council Board of the EMFL (2015-20).