that the water molecules between the spiral arms are quite unsettled, so that the interaction between the arms could be seen as a dynamic linkage instead of a static one.

#P067 - Fabrication and Characterisation of Titania Photonic Nanostructures

Tiziana Fiore - Dipartimento di Fisica e Chimica (DiFC)

Other Authors: Valentina Robbiano, Giuseppe Maria Paternò, Franco Cacialli (Department of Physics and Astronomy and London Centre for Nanotechnology, University College London, WC1E 6BT, United Kingdom) Martina Dianetti, Francesca Brunetti (CHOSECentre for Hybrid and Organic Solar Energy, Department of Electronic Engineering, University of Rome Tor Vergata, Via del Politecnico1, 00133 Rome, Italy) Bruno Giuseppe Pignataro (Dipartimento di Fisica e Chimica (DiFC), Università degli Studi di Palermo, Viale delle Scienze, Ed. 17-90128 Palermo, Italy)

Titanium dioxide is a versatile material, employed in a wide range of applications, including photovoltaic devices, energy storage and photocatalysis. In particular, in recent years TiO_2 has been incorporated effectively as scaffold layer in organo-halide perovskite solar cells, in which its porosity and meso/nanostructural arrangement play an important role in the charge transport processes occurring in such promising class of photovoltaic devices. It is thus essential to investigate the experimental parameters controlling its structural and optical features.
In this work, we report about the preparation and morphological characterization of photonic nanopatterned titania films (~ 200 nm). These monolayers were prepared via a three-steps method: i) deposition of self-assembled hexagonal closed-packed monolayers of polystyrene microspheres, ii) infiltration of the titanium precursor into the interstitial spaces of the structure and iii) removal of the colloidal crystal template by calcination. Interestingly, by simply using two different deposition techniques during the infiltration step, namely spin-coating and drop-casting, we observe the development of two distinct photonic nanostructures, honeycomb-like lattice and an hexagonal-closed packed microsphere monolayer, respectively. Titania-based nanophotonic structures might be integrated in a number of optoelectronics devices to boost their performances, i.e. as a light-trapping layer in solar cells.

#P068 - Properties of the (Ga(1-x)In(x))2O3 alloy over the whole composition range

Vincenzo Fiorentini - Università di Cagliari

Other Authors: M. B. Maccioni (U of CA), F. Ricci (U of CA)

Using density-functional ab initio techniques, we provide the first assessment of the main properties of the increasingly popular $(Ga_{1-x}In_x)_2O_3$ alloy over the whole range of composition. The alloy is isostructural at low x with beta-Ga2O3 and at high x with bixbyite In2O3, and exhibits a large and temperature-independent miscibility gap, between approximately 15 and 55% In content for the bixbyite alloy grown epitaxially on In2O3, and 15 to 85% for the free-standing bixbyite alloy. The gap, volume and band offsets to the parent compounds also exhibit anomalies as function of x. Specifically, the offsets in epitaxial conditions are predominantly type-B staggered, but have opposite signs in the two end-of-range phases.

#P069 - Behavior of the Berry phase in gapped graphene

Vincenzo Fiorentini - Università di Cagliari

Other Authors: A. Urru (U of CA), G. Cocco (Uni Freiburg i.B.)

We show that, when a gap of tunable size opens at the conic band intersections of graphene, the Berry phase does not vanish abruptly, but progressively decreases as the gap increases. Further, the phase also depends on the reciprocal-space path radius, i.e., for a doped system, the Fermi wave vector. The phase and its observable consequences can thus be tuned continuously via gap opening –by a modulating potential induced by strain, epitaxy, or nanostructuration– and doping adjustment.

#P070 - Absorption anisotropy in Ga2O3: a joint theory-experiment assessment

Vincenzo Fiorentini - Università di Cagliari

Other Authors: F. Ricci (U of CA), F. Boschi (U of Parma), A. Baraldi (U of Parma), A. Filippetti (CNR-IOM), M. Higashiwaki (NIICT, Japan), A. Kuramata (Tamura Co., Japan), R. Fornari (U of Parma)

We revisit the issue of optical absorption anisotropy in the monoclinic insulator β-Ga2O3 combining accurate optical absorption measurements with a theoretical analysis performed using different advanced computation methods based on density-functional theory including hybrids, self-interaction correction and GW. As expected, the bandgap edge of bulk β-Ga2O3 is found to depend on the polarization of light and on crystal orientation, with the lowest onset occurring at polarization in the ac crystal plane around 4.5-4.6 eV. Polarization along b unambiguously shifts the onset up by 0.2 eV. The theoretical analysis clearly indicates that the shift of the b onset is due to a suppression of the transition matrix elements of the three top valence bands at Γ point.