SCS Research Seminar

DCU
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Hybrid Low Dimensional Materials: Structural and Local Spectroscopic Studies via TEM

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In the last two decades, transmission electron microscopes (TEM) have undergone a large number of improvements allowing few meV energy resolutions for a sub-ansgtrom electron beam. These performances offer new possibilities for probing the optical, dielectric and electronic properties of nanomaterials with unprecedented spatial information, as well as for studying the atomic configuration of nanostructures. I will present a selection of recent works taking advantage of these new capabilities [1-11]. These works will concern the study of the atomic structure & configuration of nanostructures (including doped carbon nanotubes, 2D materials and bio-nanomaterials), as well as opto-electronic properties studies carried out via electron energy loss spectroscopy (EELS) measurements of different kind of low-dimensional materials (inorganic nanotubes and metallic nanoparticles). These works will illustrate the study of properties with extreme spatial resolution enabled by a Cs probe corrected STEM combined with the use of a monochromator.

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[3] R. Arenal, K. March, C.P. Ewels, et. al, Nano Lett. 14, 5509 (2014).
[4] R. Arenal, L. De Matteis, L. Custardoy, et al., ACS Nano 7, 4006-4013 (2013).
[5] M. Serra, R. Arenal, R. Tenne, Nanoscale (2019).
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[8] S. Hettler, D. Sebastian, M. Pelaez, A.M. Benito, W.K. Maser, R. Arenal, 2D Materials 8, 031001 (2021).
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[10] M. B. Sreedharaa, S. Hettler, I. Kaplan-Ashiri, K. Rechav, Y. Feldman, A. Enyashin, L. Houben, R. Arenal, R. Tenne, PNAS 118, e2109945118 (2021).
[11] M. Pelaez-Fernandez, B. Majerus, D. Funes, R. Dufour, J.L. Duvail, L. Henrard, R. Arenal, submitted.

Biography

Dr. Raul Arenal is a Senior ARAID Resarcher at the Institute of Nanoscience and Materials (INMA), CSIC-U. Zaragoza (Spain) and Leader of the Nanoscopy on Low Dimensional Materials (NLDM) group at the INMA. In 2007, he became research scientist at the CNRS (France, now on leave). He is the Coordinator of the TEM area of the LMA, U. Zaragoza. Dr. Arenal has published more than 225 papers in refereed journals (http://www.raularenal.com) and edited one book (Springer). Arenal's broad area of research interest lies in **electron microscopy** focused on materials science and nanoscience. These studies are mainly focused on the growth mechanism, structural and physical properties of **low dimensional materials** based on **carbon**, boron and nitrogen as well as other nano-structures (in particular, metallic nano-objects for **plasmonic/photonic** interest).

3.00 pm, Wednesday, 20th April, 2022
Seminar Room HG22, Nursing Building, DCU Glasnevin campus
Hosted by: Prof. Silvia Giordani (School of Chemical Sciences)