CRETE CENTER FOR QUANTUM COMPLEXITY AND NANOTECHNOLOGY

ΣΕΜΙΝΑΡΙΟ ΚΕΝΤΡΟΥ ΚΒΑΝΤΙΚΗΣ ΠΟΛΥΠΛΟΚΟΤΗΤΑΣ & ΝΑΝΟΤΕΧΝΟΛΟΓΙΑΣ/
CCQCN SEMINAR

Monday, 08 September 2014

11:00-13:00

3rd Floor Seminar Room

Addressing the origin of conductivity in two dimensional electron gases at oxide interfaces

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Abstract

Oxide interfaces exhibit sometimes functionalities that are totally new with respect to those of their constituent materials [1]. A prototypical example of this emergent behaviour is provided by the 2-dimensional electron gas (2DEG) first found at the LaAlO3/SrTiO3 interface. In this work, the properties of the 2DEGs found at the LaAlO3/SrTiO3, LaGaO3/SrTiO3 [2], NdGaO3/SrTiO3 [3] and Al2O3/SrTiO3 [4] interfaces are addressed and compared. Interfaces based on the respective amorphous counterparts, also showing a highly mobile electron gas [4,5] are also investigated. While the formation of the 2DEG in crystalline LaAlO3/SrTiO3 samples is generally attributed to the electronic reconstruction mechanism [6], conductivity in amorphous interfaces is attributed to the presence of oxygen vacancies [5]. A number of experiments have been designed and performed with the specific aim of highlighting similarities and differences of the two systems. Experimental methods include transport under electric/magnetic field, wavelength-dependent photoconductivity and different photon-based spectroscopies. The experiments presented in this work support a different origin of carriers in the amorphous and crystalline systems and are in agreement with an electrostatic mechanism being responsible for the conductivity of crystalline interfaces.

[1] F. Miletto Granozio et al., MRS Bullettin 38, 1 (2013) [2] E. Di Gennaro, F. Miletto Granozio et al, Adv. Opt. Mat. 1, 834 (2013). [3] P. Perna, F. Miletto Granozio et al., Appl. Phys. Lett.97, 259901 (2010) [4] Y. Chen et al, Adv. Mater. 26, 1462 (2014) [5] Y. Chen et al., Nano Lett. 11, 3774 (2011) [6] C. Cantoni, F. Miletto Granozio, et al., Adv. Mater. 24, 3952 (2012)

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