New frontiers of oxide electronics: correlation between electrical, magnetic and optical properties of oxide semiconductors

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Abstract
Oxide semiconductors have become of great importance in the electronic industry. A key example is the touchscreen of our smartphones and tablets. Today, the second most studied semiconductor, after silicon, is zinc oxide (ZnO), which is chemically stable, photo-corrosion resistant, and cheap. The physical properties of an oxide semiconductor can be tuned by doping with transition metals. Here we consider the case of doping with magnetic ions. We show that introducing a magnetic order is an effective way to tune the optical properties of ZnO without affecting its electrical properties. Examples will be given of electronic devices based on oxide semiconductors that are promising for applications, such as non-volatile memories, magnetic sensors and neuromorphic computing.

Speaker biography
Dr. Ruotolo received his Laurea summa cum laude in 2002 from the University of Naples (IT) “Federico II” with a thesis on superconductivity, under the supervision of Prof. A. Barone. In 2003 he joined the Dept. of Materials Science of the University of Cambridge (UK), supported by a European exchange grant. He completed his doctorate in 2006 in Naples with a thesis on spintronics, financed by the Fiat research center. In 2007, he became a Research Associate of the Hong Kong Polytechnic University before receiving a Marie Curie post-doctoral fellowship in the group of the future Nobel Laureate Prof. Albert Fert in the CNRS/Thales joint laboratory in Paris (FR). He joined the City University of Hong Kong in October 2009 as an Assistant Professor. He was promoted Associate Professor with tenure from July 2015. He has authored more than 50 papers in top-tier journals, including Nature Physics, Nature Nanotechnology and Nature Scientific Reports.