Maurizio De Crescenzi
Professore ordinario di Fisica della Materia

Address:
Dipartimento di Fisica, Università degli Studi di Roma "Tor Vergata"
Via della Ricerca Scientifica 1, 00133 Roma (Italy)
Tel: +39 06 72594532, e-mail: maurizio.decrescenzi@roma2.infn.it
Web site: http://carbonlab.roma2.infn.it/

Born in Rome 6 June 1951.
Thesis "summa cum laude" in Solid State Physics (November 1975) at the University "Sapienza" of Rome, Italy.

Scientific interests:

1976-1979 postdoctoral fellow at Paris VI University, Paris (France) where he has investigated, with prof.F.Abeles, the optical properties of thin nobel metal films in the IR, Vis and UV with synchrotron radiation.
From 1979 he focused the research activity on the structural and electronic properties of surfaces and of several semiconductors and metals, investigated by Auger, LEED, XPS and Energy Loss electron spectroscopies. He has contributed to the development of the EELFS (Extended Energy Loss Fine Structure) spectroscopic technique to investigate the local structure around a selected atom located on the surface.
In 1983 he has synthesized and structurally investigated a single layer of graphene deposited on a Ni (111) surface (R.Rosei, M.DeCrescenzi et al, Phys. Rev. B 28,1161(1983)).
In 1992 he has been actively involved in the MBE (Molecular Beam Epitaxy) growth of nanostructures of germanium deposited on silicon and in the investigation of the structural and magnetic properties of ultrathin iron and magnetic layers investigated by STM (Scanning Tunneling Microscopy) and MFM (Magnetic Force Microscopy).
In 2002 he has synthesized at Roma "Tor Vergata" University carbon nanotubes both as single wall and multiwalls. These nano-structured materials have been atomically visualized by STM, with high resolution TEM microscopy and with EELS, Auger electron and Raman spectroscopies. He has been the inventor, through a patent, of a CVD (chemical vapor deposition) method for the production of carbon nanotubes on metallic surfaces.
In 2005 he has assessed the possibility for silicon to form nanotubes in sp2 configuration. He has demonstrated that multiwall carbon nanotubes can be used to fabricate efficient photovoltaic (world record of 11% of quantum efficiency in 2015 and 13% by using single wall carbon nanotubes on silicon substrates) third generation solar cells, i.e. based on nanostructures and not on p-n junctions.

At present, he is investigating carbon nanotubes and graphene-based photodetectors for the detection of gases and chemical pollutants present in air, photovoltaic devices and the growth, structural and electronic characterization of silicene, germanene and other 2D Dirac-like nanomaterials (Topological Insulators).

Academic career:

1976-1979 he has obtained several fellowships (International fellowship funded by CNRS (France), by the French Embassy in Rome, to work at Paris VI University and by FIAT (Centro Ricerche, Orbassano, Torino) to work at INFN-Frascali synchrotron radiation facility.
1979-1983 Professor in charge at Calabria University.
1984-1985 Associated Professor at L'Aquila University.
1985-1990 Associated Professor at University of Rome "Tor Vergata". During this period he was elected at the Administration Council of the University for two years.
1990-2001 Full Professor of Solid State Physics at Camerino University. During this period he has coordinated the "Corso di Laurea in Fisica" and was member of the Administration Council of the University for seven years.
From 2001 he is full professor of Structure of Matter at Rome "Tor Vergata" University.
Under his scientific and technical direction more that 70 students have defended their thesis in Physics (five Doctorate in Physics) at the above mentioned Universities. He has partecipated in the Committee of a number of Thesis and Doctorate Thesis defended in Italian, European and overseas Universities (Grenoble, Paris VI, Marseille, Lausanne, Berlin, Montreal).
He has been for 5 years the coordinator of the Doctorate in Physics of University of Roma Tor Vergata, for 2 years that of Camerino University. He has participated to Committees of more than thirty competitions for positions of full and associate professor and researcher in Italian Universities (Camerino, Lecce, Padova, Roma "Tor Vergata", Roma "Sapienza", Roma "TRE", Cosenza, L'Aquila, Torino Politecnico, Trieste, Catania) and for researcher recruitment in CNR.
From 2011 to 2015 he has been the coordinator of the Doctorate in Physics at the University of Roma “Tor Vergata”, Roma.

Organization of National and International Conferences and Meetings:

1997 International Meeting FICH (France, Italy and Switzerland) on clusters and nanostrucures (L'Aquila).
From 2000 to 2003 he has organized the international workshop and the school N&N (Nanotubes and Nanostructures, INFN Frascati (Italy) and two editions (2003 and 2005) as Chairperson of the National INFM Meeting "Nanocose".
In 2007 Chairperson of Symposium "Nanoscale self-assembling and patterning" of E-MRS 2007 Spring Meeting, Strasbourg (France) in collaboration with dr.I.Berbezier.
2009 Chairperson of National workshop "Luce ed elettroni sui nano-materiali" (Villa Mondragone, Italy).
2010 Chairperson of the International Workshop “Light on Surfaces” (Villa Mondragone, Frascati, Italy), July 2010.
He has been in 2011 the chairperson, with prof.N.Motta (Australia) of the NanoS-E3 (Nanostructures for Sensors, Electronics, Energy and Environment) International Workshop and School on Nanotechnology (Queensland, Australia). He has organized as chairperson in collaboration with dr.I.Berbezier (France), the International Conferences “NANO-Structures Self-Assembling”, NanoSEA2006 (Aix en Provence, France), NanoSEA2008 (Rome, Italy), NanoSEA2010 (Cassis, France), NanoSEA2012 (Sardegna, Italy), NanoSEA2014 (Marseille, France), NanoSEA2016 (Sicily, Italy), NanoSEA2018 (Carqueiranne, France).

Reasearch Projects and funds:

He has partecipated, as italian coordinator, to several European Projects (Esprit, Science, Human Capital and Mobility, H2020-Rise) to develop new nanostructured materials. Thanks to these projects in 1988, he assembled the first STM (Scanning Tunneling Microscope) operating in UHV conditions in Italy, at Rome "Tor Vergata" University.
In 1993 he was funded by MURST (funds for "Grandi apparecchiature") to realize in Camerino University an apparatus of MBE (molecular beam epitaxy) for the growth of semiconducting hetero-structures.
He has received in 1998 from INFM (Istituto Nazionale di Struttura della Materia) a PRA (Progetto di Ricerca Avanzato) project, to acquire an STM apparatus to measure the magnetic surface domains of iron ultra thin films. He was the Principal Coordinator of National Research Programme of MIUR, PRIN2005: "Nanodispositivi elettronici ed optoelettronici a base di nanotubi di carbonio".
He was the coordinator of several national (PRA, PAISS of INFM) and international projects (MFA, Ministry of Foreign Affairs) of physics of nanomaterials.
2008 He was the Italian coordinator of a NIRAP (National and International Research Alliances Program Australia-Italy) funded by the Queensland Government (Solar powered nano-sensors for data acquisition).
In the recent years he has participated to the following National and International Projects:
2009-2011 Project "SinPhoNIA" funded by Istituto Nazionale di Fisica Nucleare (INFN) for the development of photodetector based on carbon nanotubes.
2009 Università Franco-Italiana (UIF), Project GALILEE: "optoélectroniques de nanotubes de carbone et nanoparticules metalliques".
2009 Ministry of Italian Health-Direzione Generale ISPESL, Project "Metodologie innovative per Tecnologica la valutazione del rischio da esposizione occupazionale a nanomateriali".
2009 Progetto Strategico Italia-Canada del Ministero Affari Esteri: "Photovoltaic application of carbon nanotubes".
2010 EOARD (European Office of Aerospace Development) USAF, (USA): "Development of new photovoltaic research & hydrid devices based on multiwall carbon nanotubes and metal nanoparticles", Grant FA8655-11-1-306,
2010-2012 Project NIRAP "Solar Program and powered nano-sensors for data acquisition and surveying in remote areas", Italian PI.
2010-2011 Project GALILEE, funded by Università Franco-Italiana (UIF), Italian coordinator: "Optoélectroniques des systèmes hybrides basés sur les nanotubes de carbone et nanoparticules metalliques",
2012 Project GALILEE, funded by UIF, Italian coordinator: "Nanotubes reconnaissance chimique: études par photoémission temps réel".
2013-2015 EOARD (European Office of Aerospace Development) USAF, (USA), Project: "3D carbon nanotube networks as mechanical, electrical and photovoltaic transducer and super-hydrophobic filter", Grant FA9550-14-1-0047.
2015 participation to European Project CoExAn (Collective Excitations in Advanced Nanostructures), MSCA-RISE-2014
2015 Project funded by Regione Lazio:" Nanopoli" to integrate carbon nanotubes into polymers compounds
2018 participation to European Project DiSeTCom (Dirac Semimetals based Terahertz Components), H2020-MSCA-RISE-2018

Bibliometry, academic activities and international recognitions:

He is author and coauthor of about 300 international publications. His H index is 47, according to Google Scholar, with about 7000 citations and Scopus with H of 40 and about 5500 citations.

He has written a book ("Electron Scattering and Related Phenomena", World Scientific 1996) on the electronic and structural properties of the surfaces and interfaces. He was the Guest Editor of several books on nanostructures and surface physics (Journal of Physics CM, Surface Science, Superlattices and Microstructures, Beilstein Journal of Nanotechnology, Journal of Nanoscience and Nanotechnology, Thin Solid Films). He is, or he has been, in the international board of editors of Surface Review Letters, Journal of Physics (Condensed Matter), Journal of Electron Spectroscopy and Nature Scientific Reports.

In November 2009 he was awarded with the title of Doctor "Honoris Causa" in Physics by the University of Aix-Marseille (France). The MFA (Ministry of Foreign Affairs) project "Photovoltaic application of carbon nanotubes", performed in collaboration with prof.M.Ali El Khakani (Montreal, Canada), has been awarded by the Chamber of Commerce of Quebec with “Venice 2010” prize.
He acted twice (for 2006 and 2007) as international referee for the ANR (Agence Nationale de la Recherche) (France) as European expert in nanotechnology. He was nominated in 2007 as an international expert to evaluate the research activity of the CNRS-IMN Laboratory at Nantes (France).
Visiting professor at Grenoble, Marseille Universities and Paris VI (France), at McMaster University (Canada) and at Aix-Marseille University (France), as visiting researcher CNRS.
Associated researcher at CNR activities of ISM (Istituto di Struttura della Materia), Frascati, Italy.
Associated researcher at INFN activities at Roma “Tor Vergata” Unit from 2001.

Selected papers published by Prof.M.De Crescenzi along his scientific career.

1) Scagliotti M, Salvato M, De Crescenzi M, Kovalchuk NG, Komissarov IV, Prischepa SL, Catone D, Di Mario L, Boscardin M, Crivellari M, Castrucci P (2019). Femtosecond light pulse response of photodetectors based on Graphene/n-Si heterojunctions. CARBON, vol. 152, p. 643-651, ISSN: 0008-6223, doi: 10.1016/j.carbon.2019.06.051
2) Salvato M, Scagliotti M, De Crescenzi M, Crivellari M, Messi R, Castrucci P (2018). Increasing Efficiency in Single-Walled Carbon Nanotube/n-Si Photodetectors by Voltage Doping. IEEE TRANSACTIONS ON NANOTECHNOLOGY, vol. 17, p. 837-840, ISSN: 1536-125X, doi: 10.1109/TNANO.2018.2844167
3) Castrucci P, Fabbri F, Delise T, Scarselli M, Salvato M, Pascale S, Francini R, Berbezier I, Lechner C, Jardali F, Vach H, De Crescenzi M (2018). Raman investigation of air-stable silicene nanosheets on an inert graphite surface. NANO RESEARCH, vol. 11, p. 5879-5889, ISSN: 1998-0124, doi: 10.1007/s12274-018-2097-6
4) De Nicola F, Salvato M, Cirillo C, Crivellari M, Boscardin M, Passacantando M, Nardone M, De Matteis F, Motta N, De Crescenzi M, Castrucci P (2017). 100% internal quantum efficiency in polychiral single-walled carbon nanotube bulk heterojunction/silicon solar cells. CARBON, vol. 114, p. 402-410, ISSN: 0008-6223, doi: 10.1016/j.carbon.2016.12.050
5) Usmani S, Aurand ER, Medelin M, Fabbro A, Scaini D, Laishram J, Rosselli FB, Ansuini A, Zoccolan D, Scarselli M, De Crescenzi M, Bosi S, Prato M, Ballerini L (2016). 3D meshes of carbon nanotubes guide functional reconnection of segregated spinal explants. SCIENCE ADVANCES, vol. 2, ISSN: 2375-2548, doi: 10.1126/sciadv.1600087
6) De Crescenzi M, Berbezier I, Scarselli M, Castrucci P, Abbarchi M, Ronda A, Jardali F, Park J, Vach H (2016). Formation of Silicene Nanosheets on Graphite. ACS NANO, vol. 10, p. 11163-11171, ISSN: 1936-0851, doi: 10.1021/acsnano.6b06198
7) De Nicola F, Salvato M, Cirillo C, Crivellari M, Boscardin M, Scarselli M, Nanni F, Cacciotti I, De Crescenzi M, Castrucci P (2016). Record efficiency of air-stable multi-walled carbon nanotube/silicon solar cells. CARBON, vol. 101, p. 226-234, ISSN: 0008-6223, doi: 10.1016/j.carbon.2016.01.099

8) De Nicola F., Castrucci Paola, Scarselli Manuela, Nanni Francesca, Cacciotti Ilaria, DE CRESCENZI M (2015). Multi-Fractal Hierarchy of Single-Walled Carbon Nanotube Hydrophobic Coatings. SCIENTIFIC REPORTS, vol. 5, ISSN: 2045-2322, doi: 10.1038/srep08583
9) SCARSELLI, MANUELA ANGELA, CASTRUCCI, PAOLA, DE CRESCENZI, MAURIZIO (2012). Electronic and optoelectronic nano-devices based on carbon nanotubes. JOURNAL OF PHYSICS. CONDENSED MATTER, vol. 24, ISSN: 0953-8984, doi: 10.1088/0953-8984/24/31/313202
10) Scarselli, M, Camilli, L, Castrucci, P, Nanni, F, Del Gobbo, S, Gautron, E, Lefrant, S, De Crescenzi, M (2012). In situ formation of noble metal nanoparticles on multiwalled carbon nanotubes and its implication in metal-nanotube interactions. CARBON, vol. 50, p. 875-884, ISSN: 0008-6223, doi: 10.1016/j.carbon.2011.09.048
11) Scarselli M, Camilli L, Matthes L, Pulci O, Castrucci P, Gatto E, Venanzi M, De Crescenzi M (2012). Photoresponse from noble metal nanoparticles-multi walled carbon nanotube composites. APPLIED PHYSICS LETTERS, vol. 101, p. 241113-1-241113-4, ISSN: 0003-6951, doi: 10.1063/1.4771125
12) Camilli L., Scarselli M. A., Del Gobbo S, CASTRUCCI, PAOLA, NANNI, FRANCESCA, Gautron, E, Lefrant, S, DE CRESCENZI, MAURIZIO (2011). The synthesis and characterization of carbon nanotubes grown by chemical vapor deposition using a stainless steel catalyst. CARBON, vol. 49, p. 3307-3315, ISSN: 0008-6223, doi: 10.1016/j.carbon.2011.04.014
13) Castrucci P, Scarselli M, De Crescenzi M, El Khakanib MA, Rosei F (2010). Probing the electronic structure of carbon nanotubes by nanoscale spectroscopy. NANOSCALE, vol. 2, p. 1611-1625, ISSN: 2040-3364, doi: 10.1039/c0nr00111b
14) Castrucci P, Tombolini, F, Scarselli M, Speiser E, Del Gobbo S, Richter W, De Crescenzi M, Diociaiuti, M, GATTO E, VENANZI M (2006). Large photocurrent generation in multiwall carbon nanotubes. APPLIED PHYSICS LETTERS, vol. 89, ISSN: 0003-6951, doi: 10.1063/1.2408648
15) De Crescenzi M, Castrucci P, Scarselli M, Diociaiuti M, Chaudhari PS, Balasubramanian C, Bhave, TM, Bhoraskar SV (2005). Experimental imaging of silicon nanotubes. APPLIED PHYSICS LETTERS, vol. 86, p. 1-3, ISSN: 0003-6951, doi: 10.1063/1.1943497
16) Gunnella R, Castrucci P, Pinto N, DAVOLI I, De Crescenzi M (1996). X-ray photoelectron diffraction study of intermixing and morphology at the Ge/Si(001) and Ge/Sb/Si(001) interface. PHYSICAL REVIEW. B, CONDENSED MATTER, vol. 54, p. 8882-8891, ISSN: 0163-1829
17) De Crescenzi M (1995). Structural surface investigation with low energy backscattered electrons. Surface Science Reports 21, p. 89-175, ISSN: 0167-5729
18) Dufour G, Rochet F, Stedile FC, Poncey C, De Crescenzi M, Gunnella R, Froment M (1997). SiC formation by reaction of Si(001) with acetylene: Electronic structure and growth mode. PHYSICAL REVIEW. B, CONDENSED MATTER, vol. 56, p. 4266-4282, ISSN: 0163-1829, doi: 10.1103/PhysRevB.56.4266
19) Rosei R, De Crescenzi M, Sette F, Quaresima C, Savoia A, Perfetti P (1983). Sructure of graphitic Carbon on Ni(111), a SURFACE EXTENDED-ENERGY-LOSS FINE-STRUCTURE study. PHYSICAL REVIEW. B, CONDENSED MATTER, vol. 28, p. 1161-1164, ISSN: 0163-1829, doi: 10.1103/PhysRevB.28.1161
20) De Crescenzi M, Antonangeli F, Bellini C, Rosei R (1983). SURFACE EXTENDED ENERGY-LOSS FINE-Structure of Oxygen on Ni(100). PHYSICAL REVIEW LETTERS, vol. 50, p. 1949-1952, ISSN: 0031-9007, doi: 10.1103/PhysRevLett.50.1949