**MAURIZIO DE CRESCENZI**

**Full professor of Physics of Structure of Matter**

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**SHORT BIOGRAPHY**

Maurizio De Crescenzi was born in 1951 in Rome (Italy). Thesis "cum laude" in Solid State Physics (November 1975) at University of Rome "La Sapienza" (Italy). He is full professor from 1990 and from 2001 he has a chair of Structure of Matter at University of Rome "Tor Vergata" (Italy). His research activity has been focused on the study of the structural and electronic properties of clean surfaces, chemisorbed species on surfaces, metallic clusters and of metal/semiconductor interfaces by using spectroscopic techniques such as Auger, LEED, XPS and Energy Loss. He has worldwide known for the development of the EELFS (Extended Energy Loss Fine Structure) electron technique, which allows the local structural investigation of surface and chemisorbed atoms. He has investigated the growth of nanostructures of Germanium/Silicon and Fe/Cu/Si ultrathin magnetic films through MBE process. Recently he has synthesized nanotubes of carbon and other nanomaterials and they have been investigated through STM and TEM microscopy and photocurrent measurements. He has demonstrated that carbon nanotubes can be used as efficient photon sensitive devices and solar cells. He has assessed for the first time the existence of silicon nanotubes. In collaboration with R.Rosei and ISM-CNR researchers**,** he has assessed the formation and the structural properties of a single layer of graphite (graphene) on Ni(111) surface. This happened thirty years before of the assignment of the Nobel Prize to Geim and Novoselov (2010) for the several properties and applications of graphene. They have recognized this discover in their Nobel laureate speech done at Stockholm in 2010.

He has participated to several European Projects (Esprit, Science, Galileo, Vigoni, Human Capital and Mobility, Rise) to develop new nanosized materials. He is author, or co-author, of more than 290 international publications (his H index is 43 and his works have been quoted 6000 times), of one book on electron and structural spectroscopies and of several books on nanostructures acting as guest editor. He has organized as chairperson several International Workshops (Nanotubes & Nanostructures 2000, 2001, 2002, 2003, Nanocose 2003, 2005) and International Conferences on surfaces and self-assembled nanostructures (NanoSEA2006, NanoSEA2008, NanoSEA2010, NanoSEA2012, NanoSEA2014, NanoSEA2016 and NanoSEA2018, in collaboration with dr.Isabelle Berbezier, CNRS, France). He is (or he has been) in the board of editors of four international Reviews (Scientific Reports (Nature), Journal of Electron Spectroscopy, Journal of Physics (Condensed Matter), Surface Review and Letters). He has acted twice (for 2006 and 2007) as international referee for the ANR (Agence Nationale de la Recherche) (France) as European expert in nanotechnology. In November 2009, he has received the title of Doctor "Honoris Causa" in Material Science awarded by the University of Aix-Marseille (France). From 2010 is “associated researcher” at laboratory ISM-CNR (Italy) and form 2009 to INFN (Istituto Nazionale di Fisica Nucleare) Italy.

**Detailed Curriculum Vitae et studiorum of prof.M.De Crescenzi**

Born in Rome 6 June 1951.

Thesis "summa cum laude" in Solid State Physics (November 1975) at the University "La Sapienza" of Rome (Italy), defending the work: "Magnetoluminescence and reflectance of the biexcitonic molecules in CdS". The thesis has been performed under the direction of prof. A.Frova and prof.F.Evangelisti.

From 1976 at present, his research activity has been focused on the study of the:

- optical properties of ultrathin metallic and semiconducting films,

- structural, electronic and magnetic properties of condensed matter,

- surfaces (clean and interacting with chemisorbed species),

-metal/semiconductor interfaces and of carbon nano-materials by means of spectroscopic techniques such as Auger, XPS and Energy Loss in reflection and STM (Scanning Tunneling Microscopy) microscope.

- synthesis and characterization of Silicon nanotubes and Silicon/Germanium nanostructures.

-synthesis, characterization and photocurrent measurements of Carbon nanotubes and graphene as active transparent electrodes for solar cells and nanoelectronic devices.

-synthesis and characterization of ultrathin films deposited on inert substrate to form silicene and 2D nanomaterials.

**Main scientific results:**

During 1980-1983 years, he has contributed actively to the development of electronic spectroscopies for the determination of the electronic properties, the interatomic distance and the local structure of atoms located on a surface of a solid structure. The most important spectroscopic technique, recognized to prof.De Crescenzi, has the acronym of EELFS (Extended Energy Loss Fine Structure) and it consisted in the measurement of the features detected in an energy loss spectrum above a core level performed in the reflection mode. The analysis of this fine structure has given the radial distribution function around a selected atom and it has allowed clarifying important structural aspects of metallic surfaces, of interface metal-semiconductor and of chemisorption of light elements such as carbon and oxygen on solid surfaces down to the atomic scale. Thanks to this technique prof. R.Rosei, researchers of CNR-ISM (dr.P.Perfetti and dr.C.Quaresima) and M.De Crescenzi have assessed the formation and the structural properties of a single layer of graphite (graphene) on Ni(111) surface (Physical Review B**27**, 1161 (1983)). This investigation happened about thirty years before of the assignment of the Nobel Prize to prof.Geim and prof.Novoselov (2010) for the several properties and applications of graphene. They have recognized the original assessment performed by Rosei and coworkes in their Nobel laureate speech done at Stockholm in 2010. Nowadays the importance of EELFS technique in the field of surface science has been world wide recognized. In particular Ertl (Nobel Prize for Chemistry 2007) and Küppers, have quoted this technique in their book on the electronic spectroscopies, among the several techniques useful to characterize surfaces, thin films and the local structure of surface atoms. For illustrating the principles and applications of the EELFS technique Maurizio De Crescenzi has been invited at several international conferences and seminars on surface science and nanomaterials.

**Teaching and academic activity:**

M.De Cresenzi has been:

PhD position from November 1976 to November 1979 at CNRS (France) and at University of Paris VI (France).

Assistent Professor of Electromagnetic Waves at Calabria University (Italy) (1979-1983), Associated Professor of Physics Laboratory at L'Aquila University (Italy) (1984-1985)

Associated Professor at University of Rome "Tor Vergata" (Italy) (1985-1990). During this period, he has been appointed as a member of the Administration Council of the University from 1987 until 1989.

In 1990, he has been appointed Full Professor of Solid State Physics at the Physics Department of the Camerino University (Italy). During this period he has been nominated as coordinator for the "Corso di Laurea in Fisica" and as a member of the Administration Council of the Camerino University (2004-2010).

From 2001, he has moved as Full Professor in Solid State Physics at Physics Department of University of Rome "Tor Vergata" (Italy). He is at present the chief of a Laboratory of Nanoscience with three permanent researchers (prof.Paola Castrucci, dr.Manuela Scarselli and dr.M.Salvato), three PhD students and one research contract position.

Under his scientific and technical supervision, more than 70 students have defended their thesis in Physics (three Doctorate in Physics) at the several Italian Universities. Most of them entered in the world of the research and are now diffused in Italy and in several parts of the world (Canada, Saudi Arabia, Australia, France, etc).

He has been appointed (from 2011 until 2016) as the coodinator of the Doctorate in Physics at the University of Roma “Tor Vergata”.

During these years, he has participated to Commissions of competitive examinations for research, associated and full professor positions in several Italian Universities (Camerino, Lecce, Padova, Roma “Tor Vergata”, Roma “La Sapienza”, Roma “TRE”, Cosenza, Torino Politecnico, Trieste).

**Scientific experience and achievements:**

From November 1975 to November 1976

He has collaborated with prof.A.Frova and prof.F.Evangelisti to the analysis of the data obtained by the thesis work.

He has collaborated with prof.E.Tosatti of SISSA and ICTP (Trieste, Italy) and Dr.G.Harbeke, of Laboratory RCA, Zurich (Switzerland) for studying the effects of spatial dispersion in the dielectric function of excitons and semiconductors.

From November 1976 to November 1977

He has obtained a fellowship of CNRS (Centre National de la Recherche Scientifique) under the direction of prof.F.Abeles (University of Paris VI, France) and Dr.Marie Luce Theye to investigate the optical properties of surfaces and interfaces through synchrotron radiation at LURE, Orsay, France. The experiences of reflectivity of thin films of Cu, Au and Cu(x)Au(1-x) alloys, deposited under ultra-high-vacuum conditions, have been performed in the spectral range 15-35 eV.

During the same period, he has collaborated with Dr.Wanda Andreoni (IBM, Zurich, Switzerland) and prof.E.Tosatti (SISSA, Trieste, Italy) to the interpretation of the excitonic lineshape of rare solid gases.

From November 1977 to February 1979:

Prof.De Crescenzi has obtained the following scholarships:

-Stage de Haut Niveau Scientifique assigned by the French Embassy at Roma (1 year),

-CEA (Centre Nucleaire pour L'Energie Atomique) (1 year),

-CNR (contributo per le relazioni internazionali) (3 months).

Such a scholarships have been used to investigate optical measurements of ultrathin films of Silver and Gold near the plasma frequency. The aim was to study the effects of the spatial dispersion in the dielectric function in thin layers deposited in ultra vacuum conditions. The research activity has been developed at Laboratoire d'Optique des Solides of Paris VI (France) in collaboration with prof.F.Abeles and Dr. Marie Luce Theye.

From February 1979 to November 1979

He has obtained a fellowship of Centro Ricerche FIAT (CRF, Torino, Italy) to perform EXAFS (Extended X-ray Absorption Fine Structure) structural measurements through the synchrotron radiation of PULS-Frascati laboratory on samples of technological and metallurgical interest. He has investigated steels after high power laser treatment, ferritic and martensitic steels and amorphous metallic glasses. The experience has been done in collaboration with dr.Ugo La Malfa (of CRF Torino, Italy) and prof.A.Balzarotti (Roma “Tor Vergata” University, Italy). The analysis of the EXAFS spectra has allowed to investigate the radial distribution function of the several metallic alloys and to establish the degree of the local disorder.

From November 1979 to November 1983:

He has collaborated with the Group of “Electronic Spectroscopies of Surfaces” directed by prof.R.Rosei at Cosenza University (Italy). He has used electronic analytical tools such as Auger, Energy Loss and X-ray Photoemission spectroscopy and LEED for the structural study of clean surfaces and upon interaction with different chemisorbed species such as Oxygen and Carbon. The use of the Energy Loss spectroscopy in reflection mode has allowed clarifying some new aspects of the interaction of the electrons with the solid matter. In particular, from the analysis of an Energy loss spectrum from a core level, it has been possible to measure fine structure very similar to those reported in the EXAFS (Extended X-ray Absorption Fine Structure) spectra, which are detected by means of X-rays. The study of these features has been interesting for the structural analysis of clean surfaces and in the determination of the atomic distances from the chemisorbed species and the substrate. This type of measure has been the subject of a publication on Physical Review Letters. Useful application of this spectroscopic technique has been the structural determination of a graphitic layer deposited epitaxially on the Ni(111) surface after dissociation of CO at high temperature. This continuous carbon monolayer showed the same structural properties of graphite and the EELFS measurement (Physical Review B**27**, 1161 (1983)) was one of the very first assessment of the graphene, which has been awarded in 2010 with the Noble prize assigned to prof.Geim and prof.Novoselov for the several applications of this nanostructure.

In the same period, he has collaborated with prof.A.Balzarotti (University of Roma “Tor Vergata”) for the study of intermetallic alloys TiFe and TiN and TiC alloys with the EXAFS spectroscopy.

He has collaborated with prof.S.Nannarone (University of Modena, Italy) to the structural study of materials such as Pd2Si and Ni2Si of relevant technological and applicative interest.

Prof.M.De Crescenzi has collaborated with prof.M.Piacentini (University of Roma “La Sapienza”) and Dr.F.Antonangeli of Laboratory PULS-INFN (Frascati, Italy) to investigate the electronic and structural properties of pure metallic iron after high power laser treatment with the aim to obtain amorphous iron at room temperature.

From November 1983 to November 1985:

He has collaborated with the group of prof. P.Picozzi of L’Aquila University (Italy) to investigate the electronic and structural properties of metallic nano-aggregates (Cu, Au, Ag, Pd, etc.) deposited on inert substrates (graphite).

He has performed Auger, XPS and Energy Loss measurements to evidence the evolution of the electronic and structural properties of few isolated atoms up to the formation of a continuous film.

Prof.M.De Crescenzi has collaborated with prof.J.Derrien at Grenoble University (France) to perform structural surface measurements of ultra-thin Cobalt film deposited on clean Silicon surfaces through the EELFS (Extended Energy Loss Fine Structure) technique. The depositions and the measurements have been performed at room temperature and as a function of the several thermal treatments.

From November 1985 to November 1990:

He has collaborated with prof.A.Balzarotti (University of Roma “Tor Vergata”, Italy) to equipe an Ultra-High-Vacuum machine to perform X-ray photoemission measurements (XPS) and inverse photoemission (BIS, Bremsstrahlung Isochromat Spectroscopy) and other several spectroscopic techniques to charcterize the materials and the surfaces. He has performed Auger and XPS measurements on magnetic semiconductors (CdMnTe) and on the high-Tc superconductors such as YBaCuO and BISCO, under the form of sinterized samples as well as of thin films.

He has performed BIS and XPS measurements on small Palladium clusters, in collaboration with prof.A.Balzarotti and prof.M.Cini (Roma Tor Vergata University, Italy) to clarify the modification of the electronic properties as a function of the cluster size and of the interaction with the substrate.

He has collaborated with prof.J.Derrien of Marseille University (France) to develop the analysis of the fine structures detected in the Auger spectra (EXFAS technique) to obtain the radial distribution function in the nearest of the deposited atom on the surface.

He has collaborated with prof.A.P. Hitchcock, at the Mc Master University, Hamilton (Canada), to investigate the structural properties of few monolayers of Copper deposited on Silver surface with the technique performed at grazing incidence to enhance the signal coming from the outer layers.

He has collaborated to an ESPRIT project funded by Europen Community, Basic Research Action, for the study the iron silicides grown on silicon surfaces, in collaboration with prof.J.Derrien (Marseille University, France). Prof.De Crescenzi has equipped an experimental apparatus, operating at Roma “Tor Vergata” University, Italy, with an STM (Scanning Tunneling Microscope) for the structural investigation of surfaces with atomic resolution. He has investigated the Silicon clean surface, reconstracted 7x7, and covered with several iron layers to form iron silice in the semiconductor and metallic phases. In collaboration with prof.A.Balzarotti and prof.M.N.Piancastelli (University of Uppsala, Sweden), he has investigated the chemisorption of ethylene on clean Si(111), (7x7) reconstructed surface to investigate the atomic environment of the adsorption sites.

From November 1990 to November 2001:

Prof. De Crescenzi has won a chair of Structure of Matter, as a full professor, and he has moved to Camerino University (Italy). He has collaborated with prof. I.Davoli to form a group of electron spectroscopy of surfaces. In particular, from 1991 to 1994 he has investigated the diffusion of photo-electrons from surfaces of monocrystals such as MgO (100). In 1993 he has obtained a financial grant, funded by MURST (funds for “Grandi apparecchiature”), to realize an apparatus for MBE (molecular beam epitaxy) for the growth of hetero-structures of Germanium deposited on Silicon surfaces, their alloys and their electronic and structural characterization. In these years, he has interested to grow superlattices of semiconductors for possible applications as optolectronic devices.

He has received a grant of 350 MLire from INFM, through a PRA (Progetto di Ricerca Avanzato) project, to acquire an STM apparatus in ultra-high-vacuum to measure though the Magnetic Force Microscopy (MFM) the magnetic surface domais of iron ultrathin films deposited on Silicon clean surfaces.

He has collaborated with prof.F.Rochet (University of Paris VI, Paris, France) and prof.R.Gunnella (University of Camerino, Italy) to investigate the chemisorption of acetylene on clean Silicon surfaces and the formation of silicon carbide layers. The structural measurements have performed by using the photodiffraction of electrons (XPD technique).

From November 2001 at present:

He has investigated several aspects of the interaction of hydrocarbon molecules with silicon surfaces to form ordered and epitaxial film of silicon carbide. He has synthesized by CVD (Chemical Vapor Deposition) method carbon nanotubes both single and multiwall. The atomic and electronic characterizations have been performed through STM, SEM, TEM and Raman. He has collaborated actively with prof.M.Ali El Khakani and prof.F.Rosei (INRS, University of Montreal, Canada) to investigate the electronic and structural properties of single wall carbon nanotubes obtained by laser ablation and measured by high resolution TEM and STM with atomic resolution.

In collaboration with prof. S.V.Bhoraskar (Pune University, India), he has assessed with STM and TEM the possibility for Silicon of growing under the form of single wall nanotubes. This experience has demonstrated that physical systems with sp3 coordination can synthesize also as sp2 honeycomb structures without showing any oxidation processes. The work has been quoted and discussed on the web site Wikipedia at the link: http://en.wikipedia.org/wiki/Silicon\_nanotubes#External\_links.

He has demonstrated the ability of multiwall carbon nanotubes to generate photocurrent in the near ultraviolet and visible spectral range using electrochemical photocurrent measurements. This result is of particular relevance in the field of photovoltaic nanodevices and for solar energy conversion applications. The solar cells obtained by depositing few tens of nanometers of Carbon nanotubes on Silicon surfaces have shown a PCE (Photocurrent efficiency) of about 13% and and EQE (External quantum efficiency) of 80%. More recently, he has demonstrated that carbon nanotubes deposited on amorphous silicon produced a sizeable photocurrent in the visible energy range. The measured external quantum efficiency showed a spectral behavior depending on the SWCNT network optical transparency, presenting a maximum up to 40% at a wavelength of about 460 nm. Ultrathin network of SWCNTs acts as semitransparent electrode and forms Schottky barrier with amorphous silicon, enabling new generation low cost amorphous silicon based solar cells. In collaboration with prof.N.Motta, Queensland University of Technology (QUT), Brisbane (Australia), prof.De Crescenzi has investigated with STM and high resolution TEM the interaction of Poly(3-hexyl-thiophene) with carbon nanotubes. The structural techniques have assessed an interesting coiling of the polymers around the carbon nanostructures. These investigations are important to enhance the electron current produced in solar cells.

He has been involved in the synthesis and characterization of multi-walled carbon nanotubes grown by CVD method without the use of metallic catalyst directly on stainless steel. The experiences have been done in close collaboration with prof.Serge Lefrant (IMN-CNRS, University of Nantes, France).

More recently, he is investigating 2D nanomaterials such as Silicene deposited on inert substrates (such as pyrolitic graphite and graphene), in collaboration with dr.Isabelle Berbezier, CNRS (Marseille, France)

**International invited positions, seminars and International Conferences:**

He has been invited to spend several research periods as a "visiting professor" at the "Fourier" University in Grenoble (France) and at University of Marseille, Marseille (France), in collaboration with prof. J.Derrien, to investigate some structural aspects of the deposition (growth, interaction and alloy formation) of transition-metals nanostructures deposited on clean silicon surfaces. He has spent three months at the McMaster University (Hamilton, Canada) in collaboration with prof. A.P.Hitchcock to study of the growth mechanisms of metallic monolayers epitaxially evaporated on metals with the help of EELFS and EXFAS electron spectroscopies. He has been invited at the University Paris VI (France) (one month) to study the interaction of carbon-based molecules with silicon surfaces in collaboration with prof.F.Rochet. More recently he has been invited, as invited professor and invited researcher, at the laboratory L2MP-CNRS and then at IM2NP-Aix Marseille University, Marseille (France) to collaborate with Dr.Isabelle Berbezier to investigate several chemical and physical properties of the of Germanium quantum dots deposited on silicon oxide layers and 2D nanomaterials.

Prof.M.De Crescenzi has received a number of invitation for seminars in Universities and Research Centers in Italy and abroad with oral and invited talks at International Meetings and Conferences:

February 1977, "Colloque Lure, Users meeting" Orsay (France), "Etude de metaux, alliages et couches superficielles"

September 1977, "Vth International Conference on Vacuum Ultraviolet Radiation Physics" Montpellier (France), "d electron excitation in Au, Cu and Cu-Au alloys"

September 1978, "14th International Conf.on the Physics of Semiconductors“, Edinbourgh (Great Britain), "Energy dissipation of free exciton polaritons in semiconducting films"

Ottober 1980, "Applicazioni delle grandi macchine alla fisica degli stati aggregati" Istituto di Fisica, Universita' di Parma, Parma (Italy),"Determinazioni strutturali locali di sistemi ordinati ed amorfi con la spettroscopia EXAFS"

June 1981- "International Symposium on core level excitations in atoms, moleculs and solids", ICTP, Trieste (Italy), "Extended Energy Loss Fine Structure spectroscopy"

September 1981, "Convegno annuale del settore metalli e leghe del GNSM " Dipartimento di Fisica, Universita' di Cosenza, Cosenza (Italy), "Proprieta' elettroniche e strutturali in sistemi disordinati".

October 1981, "Convegno annuale S.I.F." Universita' di Pisa, Pisa (Italy), "Misure strutturali EXAFS con perdita di energia degli elettroni e luce di sincrotrone", (invited talk).

December 1981, "Recent development and perspectives of surface physics", Convegno annuale del settore superfici del GNSM, Universita' di Modena, Modena (Italy), "Surface anharmonicity investigation by EELFS spectroscopy".

July 1982 -"1th International summer school on advanced coal technology" Universita' di Cosenza, Sangineto Lido (Cosenza, Italy), "Structural surface determination of carbon sites by energy loss spectra".

July 1982, "Congresso Chimico dello stato metallico", Universita' di Torino, Torino (Italy), "Studi strutturali EXAFS con luce di sincrotrone e con perdita di energia degli elettroni", (invited talk).

September 1982, "International Conference on EXAFS and Near Edge structures", INFN, Frascati (Italy), "Extended Energy Loss Fine Structure (EELFS) technique: bulk and surface investigations", (invited talk).

December 1982, "Developments and perspectives of surface physics" Convegno annuale del settore superfici del GNSM, Universita' di Modena, Modena, Italy, "Surface extended energy loss fine structures of oxygen on Ni(100)".

May 1983, "3th International Conference on graphite intercalation compounds", Pont à Mousson, Nancy (France), "Geometrical and electronic properties of graphitic carbon overlayers on Ni(111)".

September 1983, "5° Scuola estiva mediterranea sugli stati di superficie ed il legame chimico" Scuola Normale Superiore Pisa, Italy, "Effetto SEXFAS e SEELFS per la determinazione strutturale delle superfici", (invited talk).

September 1983, "5th International Conference on Solid Surfaces" Madrid (Spain)

"Surface structural investigation by reflection extended energy loss fine structure technique"

March 1984, "Colloque du Groupe Francais de croissance cristalline" Montpellier (France), "Surface structural investigation by EELFS technique" (invited talk).

June 1984, "International Symposium on Surface Spectroscopy on Adsorbates", ICTP, Trieste, Italy

"Bond-length chemisorbed species determination by Surface EELFS", (invited talk).

July 1984, "III International Conference on inorganic materials and metallic clusters" Berlin University, Germany, "Structural and electronic investigation of Cu islands on graphite"

October 1984, "Convegno scientifico annuale del settore proprieta' ottiche e dielettriche del GNSM", Alghero, Italy, "Crescita di clusters di Cu: proprieta'elettroniche e strutturali".

April 1985, "VII European Conference on Solid Surfaces (ECOSS)", Aix en Provence (France), "Extended Energy Loss Fine Structure (EELFS) technique", (invited talk).

December 1985, "Convegno scientifico annuale del settore superfici del GNSM", Dipartimento di Fisica,Universita' di Modena, Modena, Italy, "EXAFS-like structure in the Auger spectra: a new structural probe for surface investigation".

June 1986, "Colloque EXELFS/EXAFS", Ecole Centrale de Lyon, CNRS, Lyon (France), "EXELFS in the reflection mode", (invited talk).

July 1986, "IVth Internat.Conference on EXAFS and Near Edge Structure", Abbaye de Fontevraud (France), "EXAFS-like structure in the Auger spectra".

October 1986, "VIth Internat.Conference on Solid Surfaces (ICSOSS)", Baltimora (U.S.A.), "Structural characterization of surfaces by EELFS spectroscopy" (invited talk).

July 1987, "13th Course: Elemental and Molecular Clusters", E.Majorana Centre for Scientific Culture, Erice, Italy, "Techniques for the Electronic and Structural Investigation of Cu clusters " (invited talk).

December 1987, "Advances in surfaces and interface physics", Convegno annuale del settore superfici del GNSM, Universita' di Modena, Modena, Italy, "The Cu/Ag(111) interface studied by SEELFS spectroscopy".

March 1988, "International Workshop on Electron beam induced high spatial resolution spectroscopies", CNRS, Aussois (France), "Extended Auger Fine Structure analysis", (invited talk).

August 1988, "Vth Internat.Conference on EXAFS and Near Edge Structure", University of Washington, Seattle (USA), "Extended fine structure in Auger spectra: temperature and core hole dependence of Cu and Ag(111)".

September 1988,"International Workshop on Auger Spectroscopy and Electronic Structure", Universita' di Messina,Taormina, Italy, "Energy Loss extended fine structure", (invited talk).

December 1988, "13th Annual Meeting: Advances in Surface and Interface Physics" Universita' di Modena, Modena, Italy, "Bremsstrahlung Isochromat Spectroscopy (BIS) study of Pd clusters on graphite".

May 1989, "FICH ( France, Italie and Confederation Helvetique ) Workshop : Agregats supportes", Giens (France)," Surface UHV techniques for the investigation and electronic investigation of small metallic clusters", (invited talk).

October 1989, "European Conference on Application of Surfaces and Interfaces Analysis (ECASIA 89)", Cap d'Antibes, France,"Short range order investigation by low energy electrons", (invited talk).

November 1989, "Chimica Fisica delle superfici: Giornata di sensibilizzazione su problematiche industriali" Universita' di Catania, 6-7/11/1989, " Nuovi sviluppi delle tecniche elettroniche per la determinazione strutturale locale", (invited tak).

April 1990, "8th International Conference on Thin Films (ICTF-8)"San Diego, USA, "Local structure investigation by reflection electron energy loss technique", (invited talk).

May 1991, "International Summer School on Diagnostics and Applications of Thin Films", Chlum u Trebone, Czechoslovakia, "Spectroscopies with backscattered electrons", (invited talk).

September 1991, "3th European Vacuum Conference" Wien, Austria, "Extended Energy Loss Fine Structure technique: an analytical tool for surface and bulk characterization", (invited talk).

October 1991, "3eme Rencontre Internationale sur les Sciences des Materiaux", Orano, Libia, "EXAFS-like measurements with slow energy electrons", (invited talk).

and many others in the last twenty years. More recently he has been invited as invited speaker at Nano2010 (Xth International Conference on Nanostructured Materials) (Roma 2010), NanoS-E3 (Nanostructures for Sensors, Energy and Environment), Australia 2011, and at EMCMRE-2 (Istres, France 2013).

**National and International Research Projects:**

Prof.De Crescenzi has received the following research funds:

-International Research Contact CNR for 1984-1987.

prof.De Crescenzi and his collaborators have performed Energy loss measurements in grazing incidence at Service de Physique des Atomes et des Surfaces of C.E.A. (Centre pour l'Energie Atomique) of Saclay (France) in collaboration with prof.J.Lecante.

-Research Contract CNR n.86.02642.02 assigned in 1986 (35 MLire) to investigate electronic and structural measurements of surfaces and interfaces at Roma Tor Vergata University (Italy).

-Research Contract CNR n.87.02557.02 assigned in 1987 (50 MLire) for the development of the project: "Electronic and structural properities of ceramic materials" at Roma Tor Vergata University (Italy).

-International bilateral Contract CNR Italy-France1988.

Prof.De Crescenzi has collaborated with prof.J.Derrien (University of Marseille, France) to investigate the growth of ultrathin films of Cobalt deposited on clean Silicon surface through Auger spectroscopy.

"Action des Stimulation" of European Economic Community 1988.

On the basis of the bilateral contract among the Laboratory LEPES of Grenoble, France, in collaboration with prof.C.Schlenker, and the Physics Department of Roma Tor Vergata University, Italy, prof.De Crescenzi has received a finantial support of 90 MLire for the spectroscopic characterization of superconductors thin films.

"Esprit Basic Research Action" N.3026 of CEE 1989.

In collaboration with prof.J.Derrien and other europen resaerch laboratories, prof.M.De Crescenzi has received a financial support of 200 MLire for the acquisition at Roma Tor Vergata University, Italy, of a Scanning Tunneling Microscopy (STM) apparatus for characterize with atomic resolution heterostructures of layers od metal deposited on clean Silicon surfaces.

In 1993 he has obtained a financial grant, funded by MURST (funds for “Grandi apparecchiature”), of 800 MLire, to realize at Camerino University an apparatus for MBE (molecular beam epitaxy) for the growth of hetero-structures of Germanium deposited on Silicon surfaces.

In 1996 he has obtained from CNR a financial support of 30 MLire to perform resistivity measurements and electronic characterizations of ultrathin films of Lead deposited on clean Silicon surfaces to investigate possible superconductor behaviour. The measurements have been done in collaboration with prof.A.Bianconi University of Roma “La Sapienza”, Roma Italy).

In 1997 he has obtained from INFM (Istituto Nazionale di Struttura della Materia) a financial contract of 350 MLire through a PRA (Progetto di Ricerca Avanzato called SIMBRIS) in collaboration with Ferrara University (Italy) and Perugia University (Italy) for the acquisition at Camerino University, Italy, of a STM and MFM (Magnetic Tunneling) microscope operating in ultra-high-vacumm. The project has been focused to the characterization of the magnetic domains of ultrathin films of Iron and Nickel deposited on clean Silicon surfaces.

In 1998 he has obtained 100 MLire, with a project PAIS of INFM (called SICSAF) in collaboration with Modena University (Italy), prof. U.Del Pennino, for the development of growth techniques of epitaxial films of SiC deposited on clean Silicon surfaces.

In 2000 he has received a financial support of 220 MLire from MURST, PRIN2000 (Progetto di Ricerca di Interesse Nazionale), in collaboration with the Ferrara University (Italy), project directed by prof. F.Nizzoli and with Perugia University (Italy). Prof.De Crescenzi has acquired an electron analyzer to perform photodiffraction measurement to characterize ultrathin magnetic films and their electronic properties.

In 2000 he has obtained a financial support from INFM of 100 MLire, with a project PAIS (called for characterize the growth of magnetic nanodots deposited on Silicon clean surfaces with STM and MFM spectroscopies.

He has received from Italian Ministry of Research a PRIN2005 of 210.000 € to synthesize carbon nanotubes for photovoltaic applications. The growth apparatus for CVD method is operative at Roma Tor Vergata University (Italy).

He has been appointed by the Italian Ministry of Foreign Affairs of a bilateral project 2007-2008 and 2008-2009 in collaboration with prof.M.Ali El Khakani (INRS, Montreal, Canada). Project title: "Photovoltaic application of carbon nanotubes", 120000 €, focused on the area of photoinduced electron transfer, which are expected to make important contributions for the construction of efficient photovoltaic devices. This project has been awarded by the Chamber of Commerce of Quebec with “Venice 2010” prize.

He has received funds by ISPELS and Italian Ministry of Health, 2008-2009, for a project: "Innovative methodologies for risk exsposure to carbon nanotubes and other nanomaterials", 70000 €.

He has been awarded from INFN (Istituto Nazionale di Fisica Nucleare, Italy) with the project SinPhoNIA (Single Photon Nanotechnology Innovative Approach), under the direction of Dr.M.Ambrosio (Section INFN-Napoli, Italy), in 2008 and 2009, with 20000 € to investigate new detectors for high energy physics.

On the field of innovative nanomaterials for alternative energies and sensors, prof. De Crescenzi has received funds (250.000$) from Queensland Government (Australia) in collaboration with prof.Nunzio Motta (QUT University, Brisbane, Australia), through a NIRAP project, to investigate new carbon nanotubes detectors working in harsh environments.

He has been the Italian responsible of the bilateral (French-Italian) project Galileo (2008-2010) “ New Solar cells with carbon nanotubes” in collaboration with prof. Serge Lefrant of University of Nantes (France).

He has been the Italian responsible of the bilateral project (Italian-Germany) Vigoni: “Epitaxial growth of organic layers on semiconductors” (2010-2012) in collaboration with prof.Patrick Vogt of TU of Berlin (Germany).

Prof.M.De Crescenzi has received funds in 2010 and 2013 from EOARD ((European Office of Aerospace Research and Development) through Air Force Office of Scientific Research Material Command, USAF, for developing new solar cells based on carbon nanotubes.

**Organization of Conferences and scientific events:**

He has organized several National and International Conferences on surfaces and nanostructures.

In particular from 2000 to 2003 he has initiated the international workshop and the school N&N (Nanotubes and Nanostructures) (http://www.lnf.infn.it/conference /nn2000/, /2001/, /2002/, /2003/) in collaboration with Dr.S.Bellucci (INFN, Frascati, Italy) and two editions of the Italian National Meeting on Nanostructures "Nanocose" (<http://nanocose.roma2.infn.it/>) held in Genova (2003) and in Roma “Tor Vergata” University (2005), sponsored by INFM.

He has organized, in collaboration with Dr. Isabelle Berbezier (CNRS, Marseille, France), the International Conference NanoSEA2006 (Nano-Structures Self-Assembling), Aix-en-Provence (France), 2-6 July 2006.

He has organized, in collaboration with Dr. I.Berbezier (CNRS, Marseille, France), the Symposium: "Nanoscale Self-assembly and Patterning" which has been held in Strasbourg (France) within the E-MRS Spring Meeting, May 28 to June 1, 2007.

He has organized in collaboration with Dr. Isabelle Berbezier (CNRS, Marseille, France), the International Conference “NanoSEA2008”, (held in Rome, 7-10 July 2008), NanoSEA2010 (Cassis, France) and NanoSEA2012 (Sardinia, Italy) (<http://nanosea.roma2.infn.it/>).

He has organized the national meeting : ”Structure and Surfaces” held in October 2009 in Roma “Tor Vergata University”, in occasion of the 70th birthday of prof.A.Balzarotti.

He has organized as chairman the International Workshop: “Ligth on Surfaces” held in Villa Mondragone (Frascati, Italy) in July 2010 in occasion of the 70th birthday of prof.Renzo Rosei.

He has been the chairperson, together of prof.N.Motta (QUT University, Australia) of the International workshop NanoS-E3 (Nanostructures for Sensors, Electronics, Energy and Environment) held in Brisbane (Australia) in September 2011.

He has organized, as chairperson in collaboration with Dr.Isabelle Berbezier (CNRS-Marseille, France) NanoSEA2014, nanoSEA2016, NanoSEA2018.

**Papers, peer reviewed works, editorial, international committee and referee action:**

His Hirsch factor is 43 and his works have been cited more than 6000 times according to Google Scholar: https://scholar.google.it/citations?user=TC-mI00AAAAJ&hl=it .

He is author and coauthor of more than 290 international publications with peer review and of a book: "Electron Scattering and Related Phenomena", World Scientific, Singapore 1996, written in collaboration with prof. M.N. Piancastelli (Uppsala University, Sweden), on electronic and structural properties of the surfaces and applications of electron scattering.

In 1995, he has written a review paper appeared on Surface Science Reports 21, 89-176 (1995), "Surface structural measurements by low energy backscattered electrons" on the EELFS electron spectroscopy that he has actively developed during his research activity.

He has been the guest Editor of several books and special issues of reviews on nanostructures and surface physics appeared on Journal of Physics (Condensed Matter) (three special issues), Surface Science in 2007, Superlattices and Microstructures in 2009 and Thin Solid Films (2013), Beilstein Journal of Nanotechnology (2015). He has written the prefaces of all these books.

He has been in the board of editors of the following international reviews:

-Journal of Physics (Condensed Matter) from 2000 until 2004

-Surface Review and Letters (until 2012)

-Journal of Electron Spectroscopy (until 2010)

-International Journal of Bio-Inorganic Hybrid Nanomaterials (from 2012 until now)

-Nature: Scientific Reports (from 2011 until now).

International Referee: He has been in the board of evaluation of the ANR (Agence Nationale de Recherche) (France) in 2006 and 2007 (P-Nano) as european expert on nanostructures and nanotechnology.

He has been involved several international Committees for synchrotron radiation (ESFR, Grenoble), Lure and SuperACO (Orsay, France) and Elettra (Trieste, Italy).

He has acted as referee of papers submitted to several international Journals: Surface Science, Journal of Electron Spectroscopy, Journal of Physics (Condensed Matter), Physical Review B, Superlattices and Microstructures, Thin Solid Films, Applied Surface Science, Applied Physics Letters.

**International recognition:**

Prof.M.De Crescenzi has partecipated in the Committee of a number of Thesis and Doctorate Thesis defended in European and overseas Universities (Grenoble, Paris VI, Marseille, Lausanne, Berlin, Montreal)

He has acted twice (for 2006 and 2007) as international referee for the ANR (Agence Nationale de la Recherche) (France) as European expert in nanotechnology.

He has been nominated in 2007 as international expert to evaluate the research activity of the CNRS-IMN Laboratory at Nantes (France).

The project "Photovoltaic application of carbon nanotubes", done in collaboration with prof.M.Ali El Khakani (Montreal University, Canada), has been awarded by the Chamber of Commerce of Quebec with “Venice 2010” prize.

In November 2009, he has been awarded of the title of Doctor Honoris Causa in Physics at the University of Aix-Marseille (France). He has received this international recognition for his important contributions given on the field of research on nano-materials and on electronic characterizations.

**LIST OF SELECTED PUBLICATIONS**

The 290 publications of Prof.M.De Crescenzi on international reviews have obtained, until 2019, about 6000 citations. His Hirsch factor is 43 from Google Scholar at:

<https://scholar.google.it/citations?hl=it&user=TC-mI00AAAAJ>

The following list of publications has been chosen to show the constant and considerable contribution given by the candidate in the field of synthesis and characterization of surfaces, structure of matter and nano-materials. He has actively developed in 1983 the reflection energy loss electron spectroscopy (papers 1-3) from ionization core edges to investigate the local geometry of a chemisorbed species on a surface. In (4) and (5) are quoted his contributions to the investigation of Iron atoms on crystalline Silicon surfaces and of Palladium nanodots deposited on graphite. He has written a review paper with high impact factor (paper 6) and a paper (7) demonstrating the possibility to investigate through photoelectron diffraction spectroscopy the growth of monolayers of Germanium on Silicon surfaces. In (8) is quoted a book which summarizes the work done by the candidate in electron spectroscopy and scattering processes from surfaces. Paper (9) testifies the work done to study the chemisorption of C2H2 and the formation of SiC, silicon carbide, layers in epitaxy with silicon substrates. Work (10) reports an investigation of the magnetic properties of ultrathin films of Fe in epitaxy with silicon surfaces demonstrating the perpendicular orientation of the magnetic field reducing the film thickness. In (11) an STM investigation has been reported to follow in the real space the growth of Germanium nanodots. Works (12 and 13) report synchrotron radiation measurements (performed at LURE, France) to investigate the growth of ultrathin films of Germanium on Si(100) and Si(111) surfaces. Paper (14) reports for the first time the formation of silicon nanotubes, obtained through arc-discharge, visualized with STM and TEM. In (15) the photocurrent of multiwalled carbon nanotubes has been reported demonstrating the high efficiency of these nanostructures. Works (16,17) show the photovoltaic properties of nanodots of Germanium in the visible energy range. These papers have been done in close collaboration with the group of Dr.Isabelle Berbezier from IM2NP-CNRS (France). Works (18-22) are related to investigations on the photovoltaic measurements of carbon nanotubes deposited on silicon substrates showing high efficiency of photon conversion. The same carbon nanotubes have been functionalized with P3HT (Poly(3-hexylthiophene)) polymers to increase the photovoltaic response and STM data assessed the coiling of the polymers around the nanotubes. This work has been done in collaboration with prof.Nunzio Motta of QUT University (Australia). He has evidenced by STM and TEM the interaction and the polymerization of P3HT around carbon nanotubes and their peculiar functionalization. He has written a review paper (23) on the electronic and structural properties of carbon nanotubes. He has investigated a new and low cost methods to produce carbon nanotubes by using a stainless steel without catalyst precursors (paper 24).

1) "Surface extended energy loss fine structure of oxygen on Ni(100)"

M.De Crescenzi, F.Antonangeli, C.Bellini, R.Rosei,, Phys. Rev. Lett. 50,1942 (1983) ( paper cited: 90)

2) "Extended ELS fine structure above the M23 edges of Cu and Ni"

M.De Crescenzi, L.Papagno, G.Chiarello, R.Scarmozzino, E.Colavita, R.Rosei, S.Mobilio,

Solid State Communications **40**, 613-617 (1981) (paper cited : 84)

3) "Structure of graphitic carbon on Ni(111): a surface extended energy loss fine structure study", R.Rosei, M.De Crescenzi, F.Sette, C.Quaresima, A.Savoia, P.Perfetti, Physical Review B**27**, 1161-1164 (1983) (paper cited: 215)

4) "Heteroepitaxy of semiconducting and metallic silicides on silicon" N.Cherieff, R.Cinti, M.De Crescenzi, J.Derrien, T.T.A.Nguyen, J.Y.Veuillen, Applied Surface Science **41**/**42**, 241 (1989) (paper cited: 55)

5) "Palladium clusters on graphite: evidence of resonant hybrid states in the valence and conduction bands" M.Cini, M.De Crescenzi, F.Patella, N.Motta, M.Sastry, F.Rochet, R.Pasquali, A.Balzarotti, C.Verdozzi, Physical Review B**41**, 5685-5695 (1990) (paper cited: 90)

6) "Surface structural measurements by low energy backscattered electrons"

M.De Crescenzi, Surface Science Reports **21**, 89-175 (1995) (paper cited : 60)

7) "X-ray photoelectron diffraction study of intermixing and morphology at the Ge/Si(100) interface", R.Gunnella, P.Castrucci, I.Davoli, N.Pinto, D.Sebilleau, M.De Crescenzi.

Physical Review B **54**, 8882-8891 (1996) (paper cited: 38)

8) "Electron Scattering and Related Spectroscopies", M.De Crescenzi, M.N.Piancastelli,

World Scientific Publishing 1996, pp.400, Singapore, New York.

9) "SiC formation by reaction of Si(100) with acetylene; electronic structure and growth mode", G.Dufour, F.Rochet, F.C.Stedile, Ch.Poncey, M.De Crescenzi, R.Gunnella, M.Froment

Physical Review B **56**, 4266-4282 (1997) (paper cited: 78)

10) "Perpendicular and in-plane magnetic anisotropy in epitaxial Cu/Ni/Cu/Si(111) ultrathin films", G.Gubbiotti, G.Carlotti, F.D'Orazio, F.Lucari, R.Bernadini, M.De Crescenzi

Physical Review B **56**, 11073 (1997) (paper cited: 50)

11) N.Motta, A.Sgarlata, R.Calarco, J.Castro Cal, F.Patella, A.Balzarotti, M.De Crescenzi

Growth of Ge-Si epitaxial layers: intermixing, strain relaxation and island formation

Surface Science **406**, 254-263 (1998) (paper cited: 90)

12) “Exchange mechanism at the Ge/Si(100) interface from a multiple scattering analysis of the Ge L3 absorption edge”, P.Castrucci, R.Gunnella, M.De Crescenzi, M.Sacchi, G.Dufour, F.Rochet, Physical Review B **58**, 4095 (1998)

13) “Electronic density of empty states of Ge/Si(111) epitaxial layers:theory and experiment”

P.Castrucci, R.Gunnella, M.De Crescenzi, M.Sacchi, G.Dufour, F.Rochet

Physical Review B **60**, 5759 (1999)

14) "Experimental images of silicon nanotubes"

M.De Crescenzi, P.Castrucci, M.Scarselli, M.Diociaiuti, P.S.Chaudari, C.Balasubramanian, T.M. Bhave, S.V.Bhoraskar, Applied Physics Letters **86**, 231901 (2005) (paper cited: 84)

15) "Large photocurrent generation in multiwall carbon nanotubes"

P. Castrucci, F.Tombolini, M.Scarselli, E. Speiser, S. Del Gobbo, W. Richter, M. De Crescenzi, M. Diociaiuti, E. Gatto, M. Venanzi, Appl. Physi. Lett. **89**, 253107 (2006) (paper cited: 40)

16) Growth of ultrahigh-density quantum confined germanium dots on SiO2 thin films"

I. Berbezier, A. Karmous, and A. Ronda, A. Sgarlata, A. Balzarotti, P. Castrucci, M. Scarselli, M. De Crescenzi, Applied Physics Letters **89**, 063122 (2006)

17) "Optoelectronic properties in quantum-confined germanium dots",

M.Scarselli, S. Masala, P. Castrucci, M. De Crescenzi, E. Gatto M. Venanzi, A. Karmous, P. D. Szkutnik, A. Ronda, I. Berbezier, Applied Physics Letters **91**, 141117 (2007)

18) “Photocurrent generation in random networks of multiwall-carbon nanotubes grown by an “all-laser” process”, M.A. El Khakani, C.Scilletta, M. Scarselli, P. Castrucci, M. De Crescenzi, et al., , Appl. Phys.Lett. 95, 083114 (2009).

19) ”Poly(3-hexyl-thiophene) coil-wrapped single wall carbon nanotube investigated by scanning tunneling spectroscopy”, M. Giulianini, M.De Crescenzi, et al. Applied Physics Letters 95, 143116-143118 (2009).

20) “Regioregular poly(3-hexyl-thiophene) helical self-organization on carbon nanotubes”, M. Giulianini, M.De Crescenzi, et al., Applied Physics Letters 95, 013304 (2009).

21) “Enhanced photocurrent generation from UV laser synthesized single wall carbon nanotubes/n-silicon hybrid planar devices”, V.LeBorgne, M.De Crescenzi, et al., Applied Physics Letters 97, 193105 (2010).

22) “Light harvesting with multiwall carbon nanotube/silicon heterojunctions”, P.Castrucci, C. Scilletta, S. Del Gobbo, M. Scarselli, L. Camilli, M. Simeoni, B. Delley, A. Continenza, M. De Crescenzi, Nanotechnology 22, 11571 (2011).

23) “Probing the electronic structure of carbon nanotubes by nanoscale spectroscopy”, P.Castrucci, M.Scarselli, M.De Crescenzi, M.A.El Khakani, F.Rosei, Nanoscale 2, 1611 (2010).

24) “The synthesis and characterization of carbon nanotubes grown by chemical vapor deposition using a stainless steel catalyst”, L. Camilli, M. Scarselli, S. Del Gobbo, P. Castrucci, F. Nanni, E. Gautron, S. Lefrant, M.De Crescenzi, Carbon 49, 3307 (2011).

**Full list of Publications on International Journals with peer review**

**of prof.Maurizio De Crescenzi**

1) "Magnetoluminescence and reflectance investigation of the CdS biexciton"

F.Evangelisti, M.Capizzi, M.De Crescenzi, A.Frova, G.Baldacchini,

Solid State Communications 18, 795 (1976).

2) "Alloy and surface layers studies by differential reflectivity measurements"

D.Beaglehole, M.De Crescenzi, B.Thieblemont, M.L.Theye, G.Vuye,

Proc.Vth Intern.Conf.on Vacuum Ultraviolet Physics, eds. M.C.Castex,

M.Pouey, N.Pouey, Montpellier (France) 1977, p.73.

3) "d-electron excitation in Au-Cu alloys between 18 and 30 eV"

D.Beaglehole, M.De Crescenzi, B.Thieblemont, M.L.Theye, G.Vuye,

Proc.Vth Intern.Conf.on Vacuum Ultraviolet Physics,

eds.M.C.Castex, M.Pouey, N.Pouey, Montpellier (France) 1977, p.76.

4) "Surface effects in the ultraviolet reflectance of exciton in solid rare gases"

W.Andreoni, M.De Crescenzi, E.Tosatti,

Proc.Vth Intern.Conf.on Vacuum Ultraviolet Physics,

eds.M.C.Castex,M.Pouey,N.Pouey, Montpellier (France) 1977, p.220.

5) "Energy dissipation by free exciton polaritons in semiconducting films"

M.De Crescenzi,G.Harbeke, E.Tosatti,

Proc.14th Internat.Conf.on Semiconductors,ed.B.L.H.Wilson,The

Institute of Physics, Edinburgh (Great Britain) 1978, p.855.

6) "Dead layer effect in the ultraviolet reflectance of ecitons in solid rare gases"

W.Andreoni,M.De Crescenzi, E.Tosatti,

Solid State Communications 26, 425 (1978).

7) "Reflectance spectroscopy of Ag surface layers on Au and Al substrates"

M.De Crescenzi, T.Lopez-Rios, G.Vuye, N.J.Mansur, Y.Borensztein,

Thin Solid Films 57, 89(1979).

8) "The dielectric constant of gold,copper alloys between 18 and 35 eV"

D.Beaglehole, M.De Crescenzi, M.L.Theye, G.Vuye,

Physical Review B19, 6303 (1979).

9) "Contribution of longitudinal polarization waves to the optical properties of Ag surface layers"

T.Lopez-Rios, M.De Crescenzi, Y.Borensztein,

Solid State Communications 30, 755 (1979).

10) "The effect of spatial dispersion on the attenuation of excitons polaritons in semiconducting films"

M.De Crescenzi, G.Harbeke, E.Tosatti,

Solid State Communications 31, 457 (1979).

11) "Optical evidence for longitudinal waves in very thin Ag layers"

F.Abeles, Y.Borensztein, M.De Crescenzi, T.Lopez-Rios,

Surface Science 101, 123 (1980).

12) "EXAFS spectroscopy of amorphous Fe-Ni steels"

M.De Crescenzi, A.Balzarotti, F.Comin, L.Incoccia, S.Mobilio, D.Bacci,

Journal de Physique 41-C8, 238 (1980).

13) "EXAFS measurements on Fe-B metallic glasses: asymmetry of the radial distribution function"

M.De Crescenzi, A.Balzarotti, F.Comin, L.Incoccia, S.Mobilio, N.Motta,

Solid State Communications 37, 921 (1981).

14) "Effects of the asymmetry of the radial distribution function in the EXAFS of metallic glasses"

M.De Crescenzi, A.Balzarotti, F.Comin, L.Incoccia, S.Mobilio, N.Motta,

Proc.of the Daresbury Study Weekend: "EXAFS for inorganic systems"

Edited by C.D.Garner e S.S.Masnam (1981), p.199.

15) "Multipole and spin-flip interband transitions in the electron energy loss of ferromagnetic Fe"

L.S.Caputi, E.Colavita, M.De Crescenzi, S.Modesti, L.Papagno, R.Scarmozzino, R.Rosei, E.Tosatti

Solid State Communications 39,117 (1981).

16) "Extended ELS fine structure above the M23 edges of Cu and Ni"

M.De Crescenzi,L.Papagno,G.Chiarello,R.Scarmozzino,E.Colavita,R.Rosei,S.Mobilio,

Solid State Communications 40, 613 (1981).

17) "Single particle and collective excitations in ferromagnetic Iron from Electron Energy Loss spectroscopy"

E.Colavita, M.De Crescenzi, L.Papagno, R.Scarmozzino, L.S.Caputi, R.Rosei, E.Tosatti,

Physical Review B25, 2490 (1982).

18) "Electronic relaxation effects on X-ray spectra of Titanium and transition metal carbides and nitrides"

A.Balzarotti, M.De Crescenzi, L.Incoccia,

Physical Review B25, 6349 (1982).

19) "Radial distribution function of Cu and Ni by reflection Energy Loss spectroscopy"

L.Papagno,M.De Crescenzi,G.Chiarello,E.Colavita,R.Scarmozzino,L.S.Caputi, R.Rosei

Surface Science 117, 525 (1982).

20) "Structure related effect in the electronic properties of Fe80B20 alloys"

E.Colavita, M.De Crescenzi, L.Papagno, L.S.Caputi, G.Chiarello,

R.Scarmozzino, R.Rosei,

Solid State Communications 41, 545 (1982).

21) "Graphite: electronic and structural properties studied by electron energy loss and secondary electron emisssion spectroscopy"

L.Papagno, L.S.Caputi, M.De Crescenzi, R.Rosei,

Physical Review B26, 2320 (1982).

22) "Surface Extended Energy Loss Fine Structure above the K-edge of oxygen on Al"

M.De Crescenzi, G.Chiarello, E.Colavita, R.Rosei,

Solid State Communications 44, 845 (1982).

23) "Energy Loss spectroscopy study of the electronic properties alloys"

E.Colavita,M.De Crescenzi,L.Papagno,R.Scarmozzino,G.Chiarello,L.S.Caputi,R.Rosei

Proc.IVth Internat.Conf.on Rapidly Quenched Metals,

eds.T.Masumoto, K.Suzuki, The Japan Institute of Metals,Sendai 1982,p.1271.

24) "Electronic properties of Fe80B20 alloys: ordering and disordering effects"

M.De Crescenzi, E.Colavita, L.Papagno, G.Chiarello, R.Scarmozzino,

L.S.Caputi, R.Rosei,

Journal of Physics F13, 895 (1983).

25) "Structural and electronic properties of Fe and TiFe from extended and near edge structure"

N.Motta, M.De Crescenzi, A.Balzarotti,

Physical Review B27, 4712 (1983).

26) "Surface extended energy loss fine structure of oxygen on Ni(100)"

M.De Crescenzi, F.Antonangeli, C.Bellini, R.Rosei,

Physical Review Letters 50,1942 (1983).

27) "Temperature induced asymmetric effects in the surface extended energy loss fine structure of Ni(100)"

M.De Crescenzi, F.Antonangeli, C.Bellini, R.Rosei,

Solid State Communications 46, 875 (1983).

28) "Structure of graphitic carbon on Ni(111): a surface extended energy loss fine structure study"

R.Rosei, M.De Crescenzi, F.Sette, C.Quaresima, A.Savoia, P.Perfetti,

Physical Review B27, 1161 (1983).

29) "Extended Energy Loss Fine Structure technique: bulk and surface investigation"

M.De Crescenzi,

"EXAFS and Near Edge Structure"eds.A.Bianconi , L.Incoccia, S.Stipcich,

Springer Verlag Series in Chemical Physics 27,382 (1983).

(invited paper at 1th International Conf. on EXAFS and XANES, Frascati ,September 1982).

30) "Multiple scattering effects in the EXAFS of Fe and TiFe"

N.Motta,M.De Crescenzi,A.Balzarotti

"EXAFS and Near Edge Structure" eds.A.Bianconi, L.Incoccia, S.Stipcich,

Springer Verlag Series in Chemical Physics 27, 103 (1983).

31) "Geometrical structure of graphitic carbon on Ni(111) studied by Extended Energy Loss Fine Structure spectroscopy (EELFS)"

S.Modesti, M.De Crescenzi, P.Perfetti, C.Quaresima, R.Rosei, A.Savoia, P.Perfetti

"EXAFS and Near Edge Structure" eds.A.Bianconi,L.Incoccia,S.Stipcich,

Springer Verlag Series in Chemical Physics 27, 394 (1983).

32) "Oxygen on Ni(100): a surface extended energy loss fine structure study"

F.Antonangeli, C.Bellini, M.De Crescenzi, R.Rosei,

"EXAFS and Near Edge Structure" eds.A.Bianconi, L.Incoccia, S.Stipcich,

Springer Verlag Series in Chemical Physics 27, 397 (1983).

33) "Structural study of Fe and iron carbide by EELFS"

S.Polizzi, F.Antonangeli, G.Chiarello, M.De Crescenzi,

Surface Science 136, 555 (1984).

34) "Extended fine structures above Ti L23 edge: a comparison between reflection energy loss and EXAFS results"

M.De Crescenzi, G.Chiarello, E.Colavita, R.Memeo,

Physical Review B29, 3730 (1984).

35) "Reflection electron-energy-loss investigation of the electronic and structural properties of Palladium"

G.Chiarello, E.Colavita, M.De Crescenzi, S.Nannarone,

Physical Review B29, 4878 (1984).

36) "Structural and electronic properties of laser irradiated pure iron"

S.Polizzi, F.Antonangeli, M.Piacentini, M.De Crescenzi,

Solid State Communications 50, 251 (1984).

37) "Spectroscopie EXAFS, SEXAFS et EELFS: aspects experimentaux et determination des structures de surface"

M.De Crescenzi, I.Davoli,

"Adsorption et Adhesion" ed.M.Bourg, 5eme Ecole d'Eté Mediterraneenne"

Les Editions de Physique, p.239-273 (1984).

38) "Cluster growth of Cu on graphite: Auger,XPS and electron energy loss studies"

M.De Crescenzi, P.Picozzi, S.Santucci, C.Battistoni, G.Mattogno,

Solid State Communications 51, 811(1984).

39) "Aluminum collective excitations: reflection electron energy loss results"

G.Chiarello, L.S.Caputi, S.Plutino, E.Colavita, M.De Crescenzi, L.Papagno,

Surface Science 146, 241 (1984).

40) "XANES and EXAFS measurements on Pd2Si: one electron or many body effects?"

M.De Crescenzi, E.Colavita, U.del Pennino, P.Sassaroli, S.Valeri,

C.Rinaldi, L.Sorba, S.Nannarone

"EXAFS and Near Edge Structures III"eds.K.O.Hodgson, B.Hedman,

J.E.Penner-Hahn, Springer Verlag Series Chemical Physics,Berlin 1984, p.23.

41) "Reflection Extended Energy Loss Fine Structures above the Ti L2,3 Edge: a comparison with EXAFS results"

M.De Crescenzi, G.Chiarello, E.Colavita,

"EXAFS and Near Edge Structure III" eds.K.O.Hodgson, B.Hedman,

J.E.Penner-Hahn, Springer Verlag Series Chemical Physiscs, Berlin 1984, p.487.

42) "Xanes and EXAFS investigation of PdSi silicides"

M.De Crescenzi, E.Colavita, U.del Pennino, S.Valeri, P.Sassaroli, L.Sorba,

C.Rinaldi, S.Nannarone,

Physical Review B32, 612 (1985).

43) "Vacuum ultraviolet reflectivity of small gold clusters"

P.Picozzi, S.Santucci, M.De Crescenzi, F.Antonangeli, P.Piacentini,

Physical Review B31, 4023 (1985).

44) "Extended energy loss fine structures above M2,3 and L2,3 edges of transition metals"

M.De Crescenzi, G.Chiarello,

Journal of Physics C18, 3595 (1985).

45) "Vacuum ultraviolet reflectivity of very thin gold films"

P.Picozzi, S.Santucci, M.De Crescenzi, M.Piacentini, F.Antonangeli,

Thin Solid Films 126, 123 (1985).

46) "Structural and electronic investigations of Cu islands on graphite"

M.De Crescenzi,P.Picozzi,S.Santucci,C.Battistoni,G.Mattogno,

Surface Science 156, 352 (1985).

47) "Validity of the (Z+1) ion-core approximation for deep and shallow levels as studied by extended energy loss fine structure technique"

E.Châinet,M.De Crescenzi, J.Derrien,

Physical Review B31, 7464 (1985).

48) "Extended energy loss fine structure (EELFS): a new structural probe for surface and interface".

M.De Crescenzi,

Surface Science 162, 838 (1985).

(invited paper at VIIth European Conf.on Solid Surfaces (ECOSS), Aix en Provence, France).

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