

## PERSONAL INFORMATION



## Adolfo Speghini

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Sex M | Date of birth 06/03/1963 | Nationality Italian

## ACTUAL POSITION

Full Professor, Inorganic Chemistry  
Nanomaterials Research Group  
Department of Biotechnology, University of Verona  
Strada Le Grazie 15, Verona, Italy



## PERSONAL WEB SITES

<http://www.dbt.univr.it/>

<https://www.adolfospeghini.it>

[orcid.org/0000-0002-6840-0006](https://orcid.org/0000-0002-6840-0006)

## WORK EXPERIENCE

- 2019 (OCTOBER) – today: Full Professor, Inorganic Chemistry, University of Verona, Verona, Italy
- 2006 – 2019 (SEPTEMBER) Associate Professor, Inorganic Chemistry, University of Verona, Verona, Italy
- 1997 – 2006 University Researcher, Inorganic Chemistry, University of Verona, Verona, Italy
- 1994 - 1996 Postdoctoral fellowship, Chemical Sciences, University of Verona, Verona, Italy

## EDUCATION AND TRAINING

- 1990 - 1992 PhD degree in Chemistry, University of Padova, Padova, Italy
- 1982 - 1988 Master's degree in Chemistry (Summa cum Laude), University of Padova, Padova, Italy

## PERSONAL SKILLS

Mother tongue Italian

Other language(s)

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C2	C2	C2	C2	C2

Levels: A1/A2: Basic user - B1/B2: Independent user - C1/C2 Proficient user  
[Common European Framework of Reference for Languages](#)

Teaching activities

Lectures in University Degree Courses

2017- today: *Physical Chemistry*, Bachelor's degree in Biotechnology, University of Verona (Verona, Italy)

2014 – 2018 *Nanomaterials Chemistry and Laboratory*, Master's Degree in Science and Technology Aof Bio and Nanomaterials, University of Verona (Verona, Italy) and Ca' Foscari University of Venice (Venice, Italy)

2001 – today *General and Inorganic Chemistry*, Bachelor's Degree in Viticultural and Oenological Science and Technology, University of Verona (Verona, Italy)

Seminars to PhD students (last 5 years)

2019 Seminar for PhD students in Chemical Sciences, University of Cagliari (Cagliari, Italy) with a presentation on "Luminescent Nanostructures: Light in Action".

2017 Seminar to the students of the Doctoral School of Natural and Engineering Sciences, University of Verona, with a presentation on "Nanomaterials for bioimaging: an introduction and some examples".

2014 Seminar for PhD students in Materials Science and Technology, University of Catania, with presentation "Multi-purpose nanostructured systems for applications in biomedical diagnostics".

International Schools, seminars and teachings at National and International Universities

2018 "Teaching Staff Mobility" program, at Humboldt-Universität zu Berlin, Berlin, Germany. Topic: Luminescent nanostructured materials.

2017 Seminars at the course "Functional nanostructures: from microelectronics to biomedicine", Catania High School, University of Catania, Italy (9 hours).

2017 "Teaching Staff Mobility" program, at Humboldt-Universität zu Berlin, Berlin, Germany. Topic: Multifunctional nanostructured materials based on lanthanide ions: possible applications in NanoMedicine".

2016 "Teaching Staff Mobility" program, at Humboldt-Universität zu Berlin, Berlin, Germany. Thematic: Luminescent nanostructured materials for Nanomedicine.

2014 "Teaching Staff Mobility" program, at Humboldt-Universität zu Berlin, Berlin, Germany. Thematic: "Luminescent nanomaterials for modern applications".

2015 "Teaching Staff Mobility" program, at Humboldt-Universität zu Berlin, Berlin, Germany. Thematic: Multifunctional nanosized materials.

2013 Seminars at the "XIII<sup>th</sup> International Krutyn Summer School 2013 - Advanced photo- and electrically active molecular and nano-materials at the interface with living systems: challenges and promises for the future bio-medicine", organized by Prof. Marek Pietraszkiewicz (Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw, Poland), Krutyn, Poland.

2013 "Teaching Staff Mobility" program, at Humboldt-Universität zu Berlin, Berlin, Germany. Topic: "Nanostructured materials for biomedical applications".

2012 Seminars at the Doctoral School "Modeling, computational simulation and multiscale characterization for materials and life sciences", within the "Course 4: Experimental techniques for Materials and Bio-molecules characterization. 5: Thermal and optical properties", University of Modena and Reggio Emilia, Italy.

Committee Member for PhD award

2019 Member of the Selection Committee for the award of the title of Ph.D. in Chemical Sciences and Technologies, University of Cagliari, Italy.

2012, 2017 Member of the Commission for the awarding of the title of Ph.D. in Chemical Sciences, Ca' Foscari University of Venice, Italy.

2014 Member of the Selection Committee for the awarding of the title of PhD in Materials Science and Technology, University of Catania, Italy

2013 Member of the Selection Committee for the awarding of the title of Ph.D. in Chemical Sciences and Technologies, University of Cagliari, Italy.

2013 Member of the Commission for the awarding of the PhD title for a thesis titled: "Lanthanide-based dielectric nanoparticles for upconversion luminescence", supervised by Dr.

Cinta Pujol (URV) and Prof. Dr. Concepción Cascales (ICMM-CSIC), Departamento d'Enginyeria Electrònica, Elèctrica i Automàtica, Universitat Rovira i Virgili, Tarragona, Spain.

#### Research activity (in brief)

The research activity was mainly focused on the preparation and study of structural, vibrational and spectroscopic properties of various types of inorganic materials. Materials in glassy form, of single crystal and nanocrystalline, were considered activated with lanthanide ions and luminescent transition metals. Attention was paid both to the structural, vibrational and spectroscopic aspects typical of basic research and to those aimed at possible technological applications. In particular, luminescent materials have been investigated for laser applications, such as phosphors or optical contrast agents for applications in biomedicine, such as optical imaging.

Many works have been aimed at the development and optimization of nanocrystalline luminescent material synthesis methods. These methods have been oriented towards obtaining desired properties for the materials, such as for example a desired size of the crystallites (for example less than 100 nm) or morphological properties, such as a spherical or elongated shape. For this purpose, mainly wet preparative methods have been studied, such as for example the co-precipitation, the sol-gel technique and the solvothermal method. These methods have allowed to suitably guide the synthesis in order to obtain the desired crystalline phase, correctly activated with luminescent metal ions, both in the form of powders and in colloidal dispersion in the case of preparations for the synthesis of inorganic nanoparticles. Using organic coating materials, inorganic nanoparticles in dispersions with high colloidal stability were obtained in an aqueous environment. These colloidal dispersions have proven to be effectively usable as luminescent probes for nanomedicine applications, both in-vitro and in-vivo.

Many investigations have been aimed at the study and development of luminescent materials with emission in the ultraviolet, visible and near infrared spectral regions. For this purpose, the absorption and emission properties of crystals of germanates, borates, phosphates, vanadates, titanates and niobates activated with luminescent lanthanide ions, such as  $\text{Yb}^{3+}$ ,  $\text{Er}^{3+}$  and  $\text{Nd}^{3+}$ , were investigated. With the same experimental investigation techniques, the spectroscopic properties in the optical region of glassy systems doped with luminescent lanthanide ions, such as for example  $\text{Er}^{3+}$ ,  $\text{Dy}^{3+}$ ,  $\text{Tm}^{3+}$ ,  $\text{Eu}^{3+}$ , were also investigated. Spectroscopic investigations have yielded interesting information regarding the local surroundings of the metal ion. In particular, chemical-physical details have been obtained concerning electronic transitions characteristic of optically active ions accommodated in host matrices, of considerable utility for considering these materials in technological applications in the field of photonics.

Some investigations have been directed to the study of the vibrational properties of materials, both crystalline and of a glassy nature, with experimental methods such as infrared or Raman spectroscopy. This information has proved invaluable both from the point of view of the knowledge of the vibrational states of the investigated system and for an investigation into the dynamics of decay of the excited states of luminescent metal ions by multi-ring decay.

Particular attention was paid to the study of the so-called upconversion process concerning the generation of light emission (usually in an ultraviolet region, visible or near infrared) following excitation with lower energy radiation (usually in the near infrared) in systems nanocrystalline oxides or fluorides. Yttria, Lutetium or Gadolinium oxide nanoparticles activated with  $\text{Yb}^{3+}$ ,  $\text{Er}^{3+}$  or  $\text{Tm}^{3+}$  demonstrated an efficient upconversion emission following excitation with laser at 980 nm. Other crystalline structures, such as garnets, activated with luminescent lanthanide ions showed an excellent emission of upconversion. Alkaline earth metal fluoride nanoparticles, such as  $\text{CaF}_2$  or  $\text{SrF}_2$  activated with lanthanide ions, have proved to be particularly promising due to their excellent emission properties in the optical field and the ease in which they can be prepared in stable colloidal dispersion. These nanomaterials proved to be excellent contrast media in the spectral region of the first biological window (from 650 to 1000 nm), thus ensuring good penetration of both the excitatory and the emitted radiation in the case they were incorporated into biological tissues. These materials also showed a particularly intense emission in the ultraviolet region following laser excitation in the near infrared range at 980 nm.

In recent years, research has focused particularly on the development of multi-functional inorganic nanomaterials with possible biomedical applications, exploiting the peculiar luminescent properties of some lanthanide ions. These materials, such as  $\text{CaF}_2$  and  $\text{SrF}_2$  activated with  $\text{Gd}^{3+}$ ,  $\text{Yb}^{3+}$ ,  $\text{Tm}^{3+}$  or  $\text{Er}^{3+}$ , have proved to be interesting not only as luminescent probes but also as contrast agents

for the Nuclear Magnetic Resonance (MRI) technique and have also been considered for some studies in-vivo on mice. The luminescence properties of these nanoparticles proved to be useful for detecting the local temperature, with non-invasive methods, for relevant intervals in the biological field, ie around body temperature. The usefulness of these nanomaterials to measure temperature by optical thermometry in the first biological window has in fact been demonstrated. The properties of optical thermometry were investigated in  $\text{CaF}_2$  or  $\text{SrF}_2$  nanoparticles activated with  $\text{Yb}^{3+}$ ,  $\text{Er}^{3+}$ ,  $\text{Tm}^{3+}$  or  $\text{Nd}^{3+}$ , using appropriate integrated intensity ratios of emission bands, located in different spectral regions, as thermometric parameters. A suitable architecture of the nanoparticle structure according to a multi-layer system suitably activated with lanthanide ions allows to improve both the emission efficiency and, consequently, the thermometric sensitivity.

## Bibliometric indexes (Scopus)

Total number of publications: 316  
 Number of total citations: > 10700  
 h-index: 51

 Research activity at  
 International Research Centers

2019, July-August: Research activity as part of the research project "Upconversion activated photoresponsive nanocomposites" within the Internationalization Program of the University of Verona (Cooperint, outgoing mobility), at the laboratory of prof. Russel J. Compound, Materials Science and Engineering Department, University of Pennsylvania, Philadelphia, USA. The research activity focused on the incorporation of nanoparticles activated with luminescent lanthanide ions in photoresponsive polymers (1 month, visiting scholar).

2018, September: Research activity at the laboratory of prof. Nicola Pinna, Humboldt-Universität zu Berlin, Berlin, Germany. The research activity focused on nanoparticles activated with luminescent lanthanide ions (3 days).

2017, October: Research activity at the laboratory of prof. Fiorenzo Vetrone, Université du Québec, Institut National de la Recherche Scientifique – Énergie, Matériaux et Télécommunications (INRS-EMT) (Varenes, QC, Canada). The experience involved a survey of nanothermometers based on the Raman effect using metal nanoparticles (10 days).

2017, September: Research activity at the laboratory of prof. Nicola Pinna, Humboldt-Universität zu Berlin, Berlin, Germany. The research was carried out on nanocrystalline materials for nanothermometry applications (3 days).

2017, August: Research activity as part of the research project "New Materials for Nanothermometry" as part of the University Internationalization Program, University of Verona, 2016 edition, Staff Mobility Program, carried out at the International Institute Université du Québec, Institut National de la Recherche Scientifique – Energy, Matériaux et Télécommunications (INRS-EMT) (Varenes, QC, Canada). Collaboration with prof. Fiorenzo Vetrone (1 month).

2017, April: Research activity at the group of prof. José Garcia Solé, Departamento de Física de Materiales, Universidad Autónoma de Madrid, Madrid, Spain, concerning an investigation of the spectroscopic properties of rare earth fluoride nanoparticles (3 days)

2016, August: Research activity at the laboratory of prof. Nicola Pinna, Humboldt-Universität zu Berlin, Berlin, Germany. The research activity involved a survey on multi-functional luminescent nanomaterials (3 days).

2016, May: Research activity at the laboratory of prof. Fiorenzo Vetrone, Université du Québec, Institut National de la Recherche Scientifique – Énergie, Matériaux et Télécommunications (INRS-EMT) (Varenes, QC, Canada). The experience involved the development of nanothermometers for technological applications (10 days).

2015, August: Research activity at the laboratory of prof. Nicola Pinna, Humboldt-Universität zu Berlin, Berlin, Germany. The research activity involved a study of multifunctional nanomaterials for biomedicine applications (5 days).

2015, October: Research activity titled "Lanthanide doped alkaline-earth fluoride nanoparticles for multimodal imaging and nanothermometry", in the context of the University Call, University

of Verona, "Cooperint" 2014 edition, type B: Staff Mobility Program. The project involved a collaboration with prof. Fiorenzo Vetrone, Institut National de la Recherche Scientifique, Université du Québec, Canada (10 days).

2014, August: Research activity at the group of prof. Ulises, Caldino, Departamento de Fisica de la Universidad Autonoma Metropolitana – Iztapalapa, Mexico City, Mexico. The research activity involved luminescence experiments on glassy materials activated with lanthanide ions (12 days).

2014, July: Research activity at the laboratory of prof. Nicola Pinna, Humboldt-Universität zu Berlin, Berlin, Germany. Experience has focused on the characterization of oxide and fluoride materials with luminescence properties (5 days).

2013, October-November: Research activity at the group of prof. Fiorenzo Vetrone, Université du Québec, Institut National de la Recherche Scientifique – Énergie, Matériaux et Télécommunications (INRS-EMT) (Varenes, QC, Canada). The experience involved optical spectroscopy experiments of nanomedicine multi-functional nanostructures (8 days).

2013, March: Research activity at the laboratory of prof. José Garcia Solé, Departamento de Fisica de Materials, Universidad Autonoma de Madrid, Madrid, Spain, concerning an investigation of the spectroscopic properties of rare earth fluoride nanoparticles (3 days)

2012, November: Research activity at the laboratory of prof. Fiorenzo Vetrone, Université du Québec, Institut National de la Recherche Scientifique – Énergie, Matériaux et Télécommunications (INRS-EMT) (Varenes, QC, Canada). The experience involved investigations on fluoride-based nanoparticles for upconversion processes (10 days).

2013, September: Research activity at the laboratory of prof. Nicola Pinna, Humboldt-Universität zu Berlin, Berlin, Germany. The experience focused on morphological investigations of nanoparticles based on oxides and fluorides, activated with lanthanide ions (5 days).

2011, October: Research activity at the group of prof. Ulises, Caldino, Departamento de Fisica de la Universidad Autonoma Metropolitana - Iztapalapa, Mexico City, Mexico, as part of the research project in the Scientific Cooperation agreement between the Italian CNR and the Mexican National Research Council (CONACYT) - Three-year program 2009/2011, titled "White light generation in nanocrystalline oxides activated with metallic ions". Experience has focused on the study of the luminescent properties of oxide materials activated with luminescent lanthanide ions (8 days).

2010, September: Research activity at the group of Dr. Hreniak Dariusz, Institute of Low Temperature and Structure Research of the Polish Academy of Sciences, Wroclaw, Poland, as part of the research project in the Scientific Cooperation Agreement between the Italian CNR and the Polish Academy of Sciences (PAN 132.05.2), titled "Thin films of rare-earth compounds as luminescent concentrators for the improvement of the conversion efficiency of solar cells" (9 days).

2010, April: Research activity at the group of prof. Ulises, Caldino, Departamento de Fisica de la Universidad Autonoma Metropolitana - Iztapalapa, Mexico City, Mexico, as part of the research project in the Scientific Cooperation agreement between the Italian CNR and the Mexican National Research Council (CONACYT) - Three-year program 2009/2011, titled "White light generation in nanocrystalline oxides activated with metallic ions". The activity involved luminescence experiments on oxide materials in the form of thin layers activated with rare earths (7 days).

2009, September: Research activity at the group of Dr. Hreniak Dariusz, Institute of Low Temperature and Structure Research of the Polish Academy of Sciences, Wroclaw, Poland, as part of the research project in the Scientific Cooperation Agreement between the Italian CNR and the Polish Academy of Sciences (PAN 132.05.2), titled "Preparation and luminescence studies of doped nanostructures of non-linear optical materials" (12 days).

2009, May-June: Research activity at the laboratory of prof. John Capobianco, Concordia University, Montreal, Canada. The experience concerned the optimization of the spectroscopic properties of inorganic materials for applications in biomedicine (10 days).

2008, November: Research activity at the laboratory of prof. John Capobianco, Concordia University, Montreal, Canada. The experience involved luminescence experiments for investigation of spectroscopic mechanisms on compounds activated with lanthanides (10 days).

2008, September: Research activity at the laboratory of prof. Wieslaw Strek, Institute of Low Temperature and Structure Research of the Polish Academy of Sciences, Wroclaw, Poland, as part of the Research Project in the Scientific Cooperation Agreement between the Italian CNR and the Polish Academy of Sciences (PAN 132.05.2), titled "Preparation and luminescence studies of doped nanostructures of non-linear optical materials" (14 days).

2007, October: Research activity at the laboratory of prof. John Capobianco, Concordia University, Montreal, Canada. The experience involved a development of fluorescent nanocrystalline luminescent systems, with particular regard to the spectroscopic properties in the visible and near-infrared region (10 days).

2007, September: Research activity at the laboratory of prof. Wieslaw Strek, Institute of Low Temperature and Structure Research of the Polish Academy of Sciences, Wroclaw, Poland, as part of the Research Project in the Scientific Cooperation Agreement between the Italian CNR and the Polish Academy of Sciences (PAN 132.05.2), titled "Preparation and luminescence studies of doped nanostructures of non-linear optical materials" (10 days).

2007, June: Research activity at the group of prof. José Garcia Solé, Departamento de Fisica de Materiales, Universidad Autonoma de Madrid, with a project concerning the study of the spectroscopic properties of nanoparticles of oxides activated with rare earth (6 days)

2007, May: Research activity at the laboratory of prof. John Capobianco, Concordia University, Montreal, Canada. The experience involved a study on the spectroscopic properties of nanoparticles of binary and ternary oxides activated with lanthanides (10 days).

2006, September: Research activity at the group of prof. Wieslaw Strek, Institute of Low Temperature and Structure Research of the Polish Academy of Sciences, Wroclaw, Poland, as part of the project No. 12CH titled "Synthesis and investigations of physicochemical properties of ferroelectric nanostructures doped with rare-earth ions", in the area of the Executive Program of Scientific and Technological Collaboration Italy/Poland of the Ministry of Foreign Affairs (6 days).

2005, September: Research activity at the group of prof. José Garcia Solé, Departamento de Fisica de Materiales, Universidad Autonoma de Madrid, Madrid, Spain, concerning an investigation of the spectroscopic properties of oxide crystals activated with rare earths or transition metals (9 days).

2005, May: Research activity at the group of prof. Wieslaw Strek, Institute of Low Temperature and Structure Research of the Polish Academy of Sciences, Wroclaw, Poland, as part of the project No. 12CH titled "Synthesis and investigations of physicochemical properties of ferroelectric nanostructures doped with rare-earth ions", in the area of the Executive Program of Scientific and Technological Collaboration Italy/Poland of the Ministry of Foreign Affairs of the Italian Republic (5 days).

2004, September: Research activity at the group of prof. José Garcia Solé, Departamento de Fisica de Materiales, Universidad Autonoma de Madrid, Madrid, Spain, concerning an investigation of the spectroscopic properties of oxide crystals activated with rare earths or transition metals (5 days).

#### Visiting Professor

2012 (November) Université du Québec, Institut National de la Recherche Scientifique – Énergie, Matériaux et Télécommunications (INRS-EMT) (Varenes, QC, Canada). Host: Prof. Fiorenzo Vetrone.

## Scientific responsibility of research projects

2019, August: scientific coordinator of a research project titled "Upconversion activated photoresponsive nanocomposites" as part of the Internationalization Program 2018 of the University of Verona (Cooperint, outgoing mobility). The project involved a collaboration with prof. Russel J. Composto, Materials Science and Engineering Department, University of Pennsylvania, Philadelphia, USA.

2019 – today: scientific coordinator of a project titled: "High efficiency photovoltaic panels activated with Carbon Dots", within the framework of the "Joint Projects 2018", joint project between the University of Verona and the "TEA Energie" Company, Verona, Italy.

2018 – today: scientific coordinator of a project on the European Social Fund, Veneto Region, titled: "Piezoelectric polymer nanocomposites for the generation of electrical energy from movement".

2018 – today: scientific coordinator of a project on the European Social Fund, Veneto Region, titled: "Polymeric fabrics shielding for low-frequency electromagnetic radiation".

2017 – 2018: scientific coordinator of a project on the European Social Fund, Veneto Region, titled: "High efficiency innovative panels activated with Quantum Dots".

2017 – 2018: scientific coordinator of a project on the European Social Fund, Veneto Region, titled: "Innovative thermal insulating panels for thermoelectric energy generation".

2016 – 2017: scientific coordinator of a project titled: "Innovative fabrics for CEM shielding (Electro-Magnetic Fields) at low frequencies", Research grants, Development of human potential in research and innovation, Veneto Region, Italy.

2017 – 2019: scientific coordinator of the "Ricerca di Base 2015" Project, funded by the University of Verona, Italy, titled: "New Materials for Thermometry".

2016 – 2018: Italian scientific coordinator of the three-year project of the Ministry of Foreign Affairs and International Cooperation selected in the context of the Executive Program of Scientific and Technological Collaboration between the Italian Republic and the Polish Republic, titled "Development of fluoride based nanoparticles doped with Nd<sup>3+</sup> ions and co-doped with Nd<sup>3+</sup>, Yb<sup>3+</sup> in colloidal form as noncontact luminescence nanothermometers".

2017 - 2019: scientific coordinator of a research project titled "New Materials for Nanothermometry", as part of the 2016 Internationalization Program of the University of Verona (Cooperint, Action 4, type B: Staff Mobility Program). The project involved a collaboration with prof. Fiorenzo Vetrone, Institut National de la Recherche Scientifique, Université du Québec, Canada.

2015, January-February: scientific coordinator of the Short Term Mobility Project as part of the "COST Action CM1006 European F-Element Network (EUFEN)" action titled "New Rare Earth doped Nanoparticles for real 3D manipulation", concerning research activities carried out by a student of the Departamento de Fisica de Materiales, Universidad Autonoma de Madrid, Spain, at the Department of Biotechnology, University of Verona.

2014 – 2016: scientific responsible of Work Package 1 (WP leader), concerning the preparation and chemical-physical analysis of the materials involved in the project, of the "Joint Project", announced by the University of Verona, for a joint University of Verona project and the "Perfosfati Cerea Cooperative Factory", Cerea, Verona, Italy, titled: "Nanostructured material as fertilizers: effect of iron phosphates and carbon dots on plant growth and nutrition".

2014 – 2015: Project coordinator titled "Lanthanide doped alkaline-earth fluoride nanoparticles for multimodal imaging and nanothermometry", in the context of the University Call, University of Verona, "Cooperint" 2014 edition, type B: Staff Mobility Program. The project involved a collaboration with prof. Fiorenzo Vetrone, Institut National de la Recherche Scientifique, University of Québec, Canada.

2012 - today: Responsible for scientific research in the area of Chemistry and Physics of luminescent materials, as Associate at the Institute of Physics "Nello Carrara", National Research Council, University of Sesto Fiorentino, Florence, in scope of projects concerning the synthesis and characterization of materials activated with rare earth ions or transition metals, in collaboration with Dr. Giancarlo Righini and Dr. Stefano Pelli. The research activity concerns:

- the development of rare earth doped luminescent glassy systems for the manufacture of devices such as optical fibers or waveguides, generating white light following excitation in the ultraviolet or blue, also under the Italian CNR agreement - Mexican National Research Council (CONACYT);

- metal sulphides activated with rare earths for the generation of white light and energy conversion, also as part of the bilateral joint agreement between the Italian CNR and the National Academy of Sciences of Azerbaijan (two-year program 2016-2017).

2011 – 2013: Scientific Responsible (Coordinator) of the "Joint Project", announced by the University of Verona, for a joint project of the University of Verona and the Company "Performance in Lighting srl", Colognola ai Colli, Verona, titled "Development of luminescent nanocomposites activated with lanthanide ions for multicolor light emission upon excitation with Light Emitting Diodes (LED) in the UV or blue region".

2010: Scientific Responsible (Coordinator) of a project titled "New luminescent nanocrystalline materials for biomedical applications", F.S.E. 2007-2013 - "Human Capital" axis. Project Type: "Research Grants", Veneto Region.

2009 – 2010: Scientific coordinator of the project titled "Nanocrystalline compounds for multimodal imaging (optical and magnetic) in medicine", as part of the University Call, University of Verona, "Cooperint" 2008 edition, type B: Staff Mobility Program. The project involved a collaboration with prof. John Capobianco, Concordia University, Montreal, Canada.

2008: Scientific coordinator of a research grant for young Indian researchers, Ministry of Education, "Nano-science and nano-technology" technology sector (n. BRI0740EAH).



## Participation to research projects

2016 – today: Scientific participation in the European Project, Horizon 2020, titled: "SOLSA - Sonic Drilling coupled with Automated Mineralogy and chemistry On-Line-On-Mine-Real-Time". The activity mainly concerns the study of physico-chemical properties, in particular from the vibrational point of view, of materials that are relevant from a mineralogical point of view. Local coordinator of the University of Verona, Italy: prof. Gino Mariotto.

2016 – 2017: Scientific participation in a research project within the joint bilateral agreement between the Italian CNR and the National Academy of Sciences of Azerbaijan. The project is titled: "Rare earth doped sulphide materials for white light generation and energy conversion". Italian scientific coordinator: dr. Stefano Pelli, Institute of Applied Physics Nello Carrara (IFAC), CNR, Scientific Center of Sesto Fiorentino, Florence, Italy.

2012 – 2014: Scientific participation in a three-year project within the scientific agreement between the Italian National Research Council and the Mexican National Research Council (CONACYT), titled: "Frequency conversion into oxide glasses and amorphous materials doped with rare earths" . Italian coordinator: dr. Massimo Brenzi, Institute of Applied Physics Nello Carrara (IFAC), CNR, Scientific Center of Sesto Fiorentino, Florence, Italy.

2011 – 2014: Scientific participation in the "Verona Nanomedicine Initiative" research project, funded by the Cariverona Foundation, Verona, Italy. The activity specifically concerned the development and analysis from a chemical-physical point of view of nanostructured materials useful for possible applications in nanomedicine. Scientific coordinator: prof. Guido Francesco Fumagalli, University of Verona, Italy.

2010 – 2012: Scientific participation in the research project in the scientific cooperation agreement between the Italian CNR and the Polish Academy of Sciences, titled "Thin films of rare-earth compounds as luminescent concentrators for the improvement of the conversion efficiency of solar cells ". Italian manager: prof. Marco Bettinelli, University of Verona, Italy.

2010 – 2011: Scientific participation in a joint research project within the executive cooperation program in the field of Science and Technology between Japan and Italy, Italian Ministry of Foreign Affairs. The project is titled: "Nano-scale chemistry and mechanics in advanced inorganic materials". Italian scientific coordinator: prof. Marco Bettinelli, University of Verona, Italy.

2009 – 2011: Scientific participation in the research project in the framework of the scientific cooperation agreement between the Italian CNR and the CONACYT (Mexican National Science and Technology Council), titled "White light generation in nanocrystalline oxides activated with metallic ions", coordinated on the Italian side by Dr. Giancarlo Righini, IFAC, CNR, Sesto Fiorentino Science Center, Florence, Italy.

2007 – 2010: Scientific participation in the European FP6 research project NMP3-CT-2006-032636, titled "STRING - Structured Scintillators for Medical Imaging", WP coordinator of the University of Verona: Prof. Marco Bettinelli, University of Verona, Italy.

2007 – 2009: Scientific participation in the research project in the Scientific Cooperation Agreement between the Italian CNR and the Polish Academy of Sciences, titled "Preparation and luminescence studies of doped nanostructures of non-linear optical materials". Italian Manager: prof. Marco Bettinelli, University of Verona, Italy.

2005 – 2006: Scientific participation in the research project titled "Synthesis and investigations of physicochemical properties of ferroelectric nanostructures doped with rare-earth ions (12 CH)" realized within the Executive Protocol of Scientific Collaboration and Technology between the Italian Republic and the Republic of Poland. Italian Coordinator: prof. Marco Bettinelli, University of Verona, Italy.

2003 – 2005: Scientific participation in the PRIN 2003 project, titled "Synthesis, characterization and visible luminescence of nanopowders and nanocomposites activated with lanthanide ions", scientific coordinator prof. Marco Bettinelli, University of Verona, Italy.

2002 – 2004: Scientific participation in the PRIN 2002 project, titled "Relationship between properties and structure in sintered nanostructured materials", scientific coordinator prof. Giorgio Spinolo, University of Pavia.

2001 - 2003 Scientific participation in the PRIN 2001 project, titled "Synthesis and luminescence in the

visible of nanocrystalline oxides", scientific coordinator prof. Marco Bettinelli, University of Verona, Italy.

1999 – 2001: Scientific participation in the PRIN 1999 project, titled "Preparation, characterization and spectroscopic study of nanocrystalline oxides doped with lanthanide ions", scientific coordinator prof. Giorgio Flor, University of Pavia, Italy.

1998 – 2000: Scientific participation in the 1997 PRIN project, titled "Preparation, characterization and spectroscopic study of oxide glasses doped with lanthanide ions", scientific coordinator prof. Giorgio Flor, University of Pavia, Italy.

#### Main international collaborations

Prof. Fiorenzo Vetrone, Institut National de la Recherche Scientifique, Université du Québec, Varennes, Quebec, Canada.

Prof. John Capobianco, Concordia University, Montreal, Quebec, Canada.

Prof. Eva Hemmer, Department of Chemistry and Biomolecular Sciences, University of Ottawa, Ontario, Canada.

Prof. Josè Garcia Solè, Prof. Daniel Jaque, Departamento Fisica de Materiales, Universidad Autonoma de Madrid, Madrid, Spain.

Prof. Wieslaw Strek, Dr. Dariusz Hreniak, Institute of Low Temperatures and Structure Research, Polish Academy of Sciences, Wroclaw, Poland.

Prof. Nicola Pinna, Humboldt-Universität zu Berlin, Institut für Chemie & IRIS Adlershof, Berlin, Germany.

Prof. Ulises Caldino, Universidad Autonoma Metropolitana, Mexico City, Mexico.

Prof. Francisco Diaz, Universitat Rovira i Virgili, Tarragona, Spain.

Prof. C. K. Jayasankar, Department of Physics, Sri Venkateswara University, Tirupati, India.

#### Supervision of Research Scholars from international scientific institutions

2019, September: Supervision of a Bachelor student coming from Advanced Materials Engineering and Modelling Group, Department of Chemistry, Wroclaw, Poland (supervisor Dr. Olesiak-Banska). Research project at NRG, Department of Biotechnology, University of Verona: "Upconverting fluoride-based nanoparticles for biomedical applications".

2019, May-July: Supervision of a PhD student coming from Laboratory of Biobased Chemistry and Technology and Laboratory of BioNano Technology, Wageningen University & Research, Wageningen, The Netherlands (supervisor Prof. A. Velders). Research project at NRG, Department of Biotechnology, University of Verona: "Lipoprotein-based nanocarriers of upconverting nanoparticles (UCNPs)" in the framework of the Internationalization Project of the University of Verona, 2018 (Cooperint, incoming mobility).

2018, September-October: Supervision of a post-doc, Institut National de la Recherche Scientifique, Quebec, Canada. Research project at NRG, Department of Biotechnology, University of Verona: "Investigation on the thermometric properties of lanthanide doped fluoride nanoparticles".

2017, April-July: Supervision of a PhD Student, Institute of Low Temperatures and Structure Research, Polish Academy of Sciences, Wroclaw, Poland, as part of the 2016 Internationalization Project, University of Verona, research project: "Investigation on the luminescence properties of lanthanide doped fluoride nanoparticles as a function of the particle size".

2017, April – August: Supervision of a Master student in "Molecular Life Sciences", Wageningen University, The Netherlands. Research project at NRG, Department of Biotechnology, University of Verona titled: "Visible upconversion luminescence from lanthanide-based metal-organic frameworks".

2015, January-February: Supervision of a student of the Departamento de Fisica de Materiales, Universidad Autonoma de Madrid, Madrid, Spain, Short Term Mobility project as part of the action "COST Action CM1006 European F-Element Network (EUFEN)" from title "New Rare Earth doped Nanoparticles for real 3D manipulation".

Visiting Scientists from  
International Scientific Institutions

2019, September-October: Dr. Dariusz Hreniak, Institute of Low Temperatures and Structure Research, Polish Academy of Sciences, Wroclaw, Poland, as part of a project on the European Social Fund, Veneto Region, titled: "Shielding polymeric fabrics for low frequency electromagnetic radiation".

2019, May: Prof. Nicola Pinna, Humboldt University of Berlin, Institut für Chemie & IRIS Adlershof, Berlin, Germany, as part of a project on the European Social Fund, Veneto Region, titled: "Piezoelectric polymer nanocomposites per generation of electricity from the movement".

2019, February, July: Dr. Dariusz Hreniak, Institute of Low Temperatures and Structure Research, Polish Academy of Sciences, Wroclaw, Poland, as part of a project on the European Social Fund, Veneto Region, titled: "Shielding polymeric fabrics for low frequency electromagnetic radiation".

2018, December, 2017, September, 2016, December: Dr. Dariusz Hreniak, Polish Scientific Manager (Polish Coordinator) of the three-year Project of the Ministry of Foreign Affairs and International Cooperation selected within the Executive Program of Scientific and Technological Collaboration between the Republic Italian and the Polish Republic, titled "Development of fluoride based nanoparticles doped with Nd<sup>3+</sup> ions and co-doped with Nd<sup>3+</sup>, Yb<sup>3+</sup> in colloidal form as noncontact luminescence nanothermometers".

Organization of international  
conferences

2006, August "Fourth Italian-Korean Joint Meeting on Inorganic Chemistry (KIMIC IV)", held in Malcesine, Verona, Italy (member of the organizing committee).

2012, August "8th International Conference on f-Elements (ICFE8)", held in Udine, Italy (member of the organizing committee).

2015, August "XXIII International Materials Research Congress, Symposium 6E. Luminescent Materials: Basic Phenomena and Applications (in Celebration of the International Year of Light)", held in Cancun, Mexico (co-chair).

## COST Action Management

2014-2018: Participation to the Management Committee del CMST COST Action CM1403 - The European upconversion network - from the design of photon-upconverting nanomaterials to biomedical applications.

[http://www.cost.eu/COST\\_Actions/cmst/CM1403?management](http://www.cost.eu/COST_Actions/cmst/CM1403?management)

Supervision of Bachelor's and  
Master's degree students

AY 2018/2019

Supervisor of the thesis: "Investigation of hyperthermia and MRI properties of colloidal dispersions of magnetite", Bachelor's degree in Bioinformatics, University of Verona, Italy.

Supervisor of the thesis: "Synthesis and characterization of fluorescent core(fluoride)-shell(oxide) nanoparticles", Bachelor's degree in Bioinformatics, University of Verona, Italy.

Supervisor of the thesis: "Functionalization of inorganic nanoparticles with biocompatible polymers", Bachelor's degree in Bioinformatics, University of Verona, Italy.

Supervisor of the thesis: "Modified Nanostructured Bismuth Ferrite Thin Films for Application in Photoelectrocatalysis", Master's degree in Science and Technology of Bio and Nanomaterials, University of Verona and Ca' Foscari University of Venice, Venice, Italy.

Supervisor of the thesis: "Development of inorganic RNA binding nanostructures for gene silencing", Bachelor's degree in Biotechnology, University of Verona, Italy.

AY 2017/2018

Supervisor of the thesis: "Influence of reaction conditions on the colloidal and luminescent properties of nanocrystalline ZnO", Bachelor's degree in Bioinformatics, University of Verona, Italy.

Supervisor of the thesis: "Layered hydroxide nanostructures (nanoLDH): synthesis, characterization and molecular adsorption", Bachelor's degree in Viticultural and Oenological Science and Technology,

University of Verona, Italy.

Supervisor of the thesis: "Synthesis and characterization of nanoparticles activated with lanthanide ions", Bachelor's degree in Biotechnology, University of Verona, Italy.

Co-supervisor of the thesis: "Preliminary investigation on the activation of a DASA (Donor-Acceptor Stenhouse Adducts) compound using NIR-to-VIS upconversion of inorganic nanoparticles", Bachelor's degree in Industrial Biotechnology, University of Milano Bicocca, Milan, Italy.

AY 2016/2017

Supervisor of the thesis: "Photoactivable organic-inorganic nanoparticles for nanomedicine applications", Bachelor's degree in Biotechnology, University of Verona, Italy.

Supervisor of the thesis: "Preparation and characterization of Quantum Dots based on  $\text{CuInS}_2$ ", Bachelor's degree in Biotechnology, University of Verona, Italy.

Supervisor of the thesis: "Development of ZnO nanoparticles for nanomedicine applications", Master's degree in Bioinformatics and Medical Biotechnology, University of Verona, Italy.

Supervisor of the thesis: "Potassium and ytterbium fluoride nanoparticles activated with luminescent lanthanide ions for applications in biomedical diagnostics", Master's degree in Bioinformatics and Medical Biotechnology, University of Verona, Italy.

Supervisor of the thesis: "Micellar systems for biomedical diagnostics and drug delivery", Master's degree in Science and Technology of Bio and Nanomaterials, University of Verona and Ca' Foscari University of Venice, Venice, Italy.

Supervisor of the thesis (co-supervisor): "Structural and spectroscopic investigation of sodium and calcium fluoride nanostructures activated with lanthanide ions", Master's degree in Chemistry, University of Bologna, Italy.

AY 2015/2016

Supervisor of the thesis: "Use of cerium oxide nanoparticles for the colorimetric determination of polyphenolic molecules", Bachelor's degree in Viticultural and Oenological Science and Technology, University of Verona, Italy.

Supervisor of the thesis: Luminescent nanoparticles activated with lanthanide ions for photodynamic therapy and their conjugation with GFP", Master's degree in Science and Technology of Bio and Nanomaterials, University of Verona and Ca' Foscari University of Venice, Venice, Italy.

Supervisor of the thesis: "Investigation on the interaction between Nanoparticles and Green Fluorescent Protein (GFP) using Spectroscopic and Calorimetric techniques", Master's degree in Science and Technology of Bio and Nanomaterials, University of Verona and Ca' Foscari University of Venice, Venice, Italy.

AY 2014/2015

Supervisor of the thesis: "Development of lanthanide doped alkaline-earth fluorides core-shell nanoparticles for nanothermometry and drug delivery", Master's degree in Science and Technology of Bio and Nanomaterials, University of Verona and Ca' Foscari University of Venice, Venice, Italy.

AY 2013/2014

Supervisor of the thesis: "Nanostructured systems for drug delivery that can be activated with light: preliminary studies", Bachelor's degree in Biotechnology, University of Verona, Italy.

Supervisor of the thesis: "CaF<sub>2</sub> inorganic nanoparticles functionalized for imaging, tumor targeting and interaction with nucleic acids", Bachelor's degree in Biotechnology, University of Verona, Italy.

Supervisor of the thesis: "Study on the interaction of calcium fluoride nanoparticles with DNA", Bachelor's degree in Biotechnology, University of Verona, Italy

AA 2012/2013

Supervisor of the thesis: "Preparation of CaF<sub>2</sub> NPs with Upconversion properties and their functionalization with folic acid for tumor targeting", Bachelor's degree in Chemistry and Materials Chemistry, University of Bologna, Italy.

#### Supervision of PhD students

XXXI Cycle: Supervisor of the thesis: "Exploiting transition metal and lanthanide ions as dopants in oxide and fluoride nanoparticles for nanothermometry and broad band optical sensitization", PhD in Nanoscience and Advanced Technologies, Graduate School of Natural and Engineering Sciences, University of Verona, Italy.

XXIX Cycle: Supervisor of the thesis: "Lanthanide doped alkaline-earth fluoride nanoparticles as biomedical probes", PhD Course in Nanoscience and Advanced Technologies, School of Natural and Engineering Sciences, University of Verona, Italy.

XXVIII Cycle: Supervisor of the thesis: "Nanocrystalline materials for photovoltaic and nanomedicine applications", PhD in Nanotechnology and Nanostructured Materials for Biomedical Applications, School of Science, Engineering and Medicine, University of Verona, Italy.

XXVII Cycle: Supervisor of the thesis: "Multifunctional Inorganic Nanoparticles for Biomedical Diagnostics", PhD in Nanotechnology and Nanostructured Materials for Biomedical Applications, School of Science, Engineering and Medicine, University of Verona, Italy.

XXIV Cycle: Supervisor of the thesis: "Lanthanide ion activated nanoparticles for multimodal imaging", PhD in Nanotechnology and Nanostructured Materials for Biomedical Applications, School of Science, Engineering and Medicine, University of Verona, Italy.

XXIII Cycle: Supervisor of the thesis: "Synthesis, structural and morphological characterization and spectroscopic investigation of gadolinium oxyfluoride nanoparticles and gadolinium fluoride activated with luminescent lanthanide ions", PhD in Biotechnology, School of Science, Engineering and Medicine, University of Verona, Italy.

#### Supervision of scholarship holders or research fellows for research projects:

2019–today: "Nanomaterials for hyperthermia".

2018–today: "Development of nanomaterials for thermometry"

2018–2019: "New nanomaterials for optical thermometry".

2018– 2019: "Synthesis of piezoelectric polymer nanocomposites for generation of electrical energy from movement".

2018–2019: "Polymeric fabrics shielding low-frequency electromagnetic radiation: synthesis of materials and incorporation into polymeric fabrics".

2017-2018: "Innovative thermal insulation panels for thermoelectric energy generation".

2017-2018: "Innovative photovoltaic panels activated with Quantum Dots".

2016-2017: "Development of nanostructured systems for nanomedicine".

2016-2017: "Development of innovative fabrics for screening C: E.M. (Electro Magnetic Fields) at low frequencies".

2015-2016: "Nanostructured materials as fertilizers: effect of iron phosphates and carbon dots on plant growth and nutrition".

2012-2015: "Development of nanocomposites activated with lanthanide ions by multi-color emission following excitation with light-emitting diodes (LEDs) in UV or blue".

2013: "Preparation and characterization of multi-functional nano-structural systems for nanomedicine applications".

2010-2011: "New luminescent nanocrystalline materials for biomedical applications".

2009: "Synthesis, structural and spectroscopic characterization of nanocrystalline and massive oxides doped with transition metals or lanthanides for biomedical applications".

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#### Awards

**FFABR2017 - Funding for basic research activities (FFABR), established by Italian Law n. 232/2016:** admitted for individual financing of basic research activities (Associate Professors).

#### **ANVUR - Research Quality Assessment (VQR) 2011-2014**

6 scientific publications as co-author submitted to the VQR by various Italian Research Institutes.

Results of the VQR: 5 publications with excellent evaluation (score 1.0) and 1 publication with high evaluation (score 0.7).

## National and International research projects

- 2019 Evaluation as a scientific reviewer of research projects, Executive Government Agency of National Science Centre, Krakow, Poland.
- 2018 Evaluation as a scientific reviewer of research projects, ERC Advanced Grant 2017, European Research Council (ERC), EU.
- 2018 Evaluation as a scientific reviewer of research projects, Executive Government Agency of National Science Centre, Krakow, Poland.
- 2016 Evaluation Panel Member (Engineering and Technology) of research projects, Fundação para a Ciência e a Tecnologia, I. P. (FCT), Portuguese Ministry of Science and Education, Lisbon, Portugal.
- 2016 Evaluation as a scientific reviewer of research projects "Exploratory Research Projects", UEFISCDI Evaluation Process, Romanian Executive Agency for Higher Education, Research, Development and Innovation Funding, Bucharest, Romania.
- 2015 Evaluation as a scientific reviewer of research projects, Canada Foundation for Innovation - Fondation Canadienne pour l'Innovation, Ottawa, Canada.
- 2015 Evaluation as a scientific reviewer of research projects, Executive Government Agency of National Science Centre, Krakow, Poland.
- 2014 Evaluation as a scientific reviewer of research projects (FIR2014), Università di Catania, Italy.
- 2014 Evaluation as a scientific reviewer of research projects "Exploratory Research Projects", UEFISCDI Evaluation Process, Romanian Executive Agency for Higher Education, Research, Development and Innovation Funding, Bucharest, Romania.
- 2013 Evaluation as a scientific reviewer of research projects, Research Grants Council, Hong Kong, China.
- 2013 Evaluation as a scientific reviewer of research projects FIRB "Futuro in Ricerca 2013", Italian Ministry of Instruction, University and Research, Italy.
- 2012 Evaluation as a scientific reviewer of research projects and Evaluation Panel Member (Physics), Executive Agency for Higher Education, Research, Development and Innovation Funding, Bucarest, Romania.
- 2010 Evaluation as a scientific reviewer of research projects FIRB (Futuro in Ricerca), Ministero Italiano dell'Istruzione, Università e Ricerca.
- 2010 Evaluation as a scientific reviewer of a post-doc research project, Estonian Science Foundation, Estonia.

## International Scientific Journals

*American Chemical Society:*

ACS Nano, ACS Applied Materials & Interfaces, ACS Biomaterials Science & Engineering, ACS Photonics, Biomacromolecules, Chemical Reviews, Chemistry of Materials, Crystal Growth & Design, Inorganic Chemistry, Journal of Physical Chemistry, Journal of the American Chemical Society, Langmuir, ACS Omega.

*Royal Society of Chemistry:*

Chemistry Communications, CrystEngComm, Dalton Transactions, Inorganic Chemistry Frontiers, Journal of Materials Chemistry, Nanoscale, Physical Chemistry Chemical Physics, RSC Advances, Materials Horizons.

*Elsevier:*

Advances in Colloid and Interface Science, Applied Surface Science, Biomaterials, Biosensors and Bioelectronics, Ceramics International, NanoToday, Journal of Luminescence, Journal of Solid State Chemistry, Optical Materials, Materials Chemistry and Physics, Sensors & Actuators: B. Chemical.

*Springer:*

Applied Nanoscience, Applied Physics A: Materials Science & Processing, Applied Physics B: Lasers and Optics, Nanoscale Research Letters.

*Wiley – ChemPubSoc:*

Advanced Functional Materials, Advanced Materials, Chemistry – A European Journal, Chemistry - An Asian Journal, ChemPhysChem, ChemistrySelect, European Journal of Inorganic Chemistry

## Editorial Boards

- 2018 – today: IET Nanobiotechnology, IET Digital Library (Associate Editor)
- 2017 – today: Advances in Materials Science and Engineering, Hindawi Publishing Corporation
- 2015 – today: Journal of Nanomaterials, Hindawi Publishing Corporation
- 2013 – today: Journal of Nanoparticle Research, Springer Science (Associate Editor)

## Covers of scientific journals

1- Cover of Biomaterials Science (Royal Society of Chemistry, Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, CB4 0WF, UK) for the article: "Multifunctional nanoprobe based on upconverting lanthanide doped CaF<sub>2</sub>: towards biocompatible materials for biomedical imaging", Biomater. Sci., 2014, 2, 1158-1171. <http://pubs.rsc.org/en/Content/ArticleLanding/2014/BM/C4BM00119B#!divAbstract>

2- Cover of Journal of Materials Chemistry (Royal Society of Chemistry, Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, CB4 0WF, UK) per l'articolo: "Structural and optical investigation of colloidal Ln<sup>3+</sup>/Yb<sup>3+</sup> co-doped KY<sub>3</sub>F<sub>10</sub> nanocrystals", J. Mater. Chem., 2009, 19, 3149–3152. <http://pubs.rsc.org/en/content/articlepdf/2009/jm/b900300b>

3- Cover of Advanced Materials (WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim) per l'articolo: "Lanthanide Nanocrystals: Colloidal Tm<sup>3+</sup>/Yb<sup>3+</sup>-Doped LiYF<sub>4</sub> Nanocrystals: Multiple Luminescence Spanning the UV to NIR Regions via Low-Energy Excitation", Adv. Mater., 21, 2009, 4025–4028. <http://onlinelibrary.wiley.com/doi/10.1002/adma.200901174/full>



**Highly Cited Papers** 1- Highly Cited Paper (WoS), 110 time cited: "1.3  $\mu\text{m}$  emitting  $\text{SrF}_2:\text{Nd}^{3+}$  nanoparticles for high contrast in vivo imaging in the second biological window", by: I. Villa, A. Vedda, I. X. Cantarelli, M. Pedroni, F. Piccinelli, M. Bettinelli, A. Speghini, M. Quintanilla, F. Vetrone, U. Rocha, C. Jacinto, E. Carrasco, F. Sanz Rodriguez, A. Juarranz, B. del Rosal, BlancaDirk H. Ortgies, P. Haro Gonzalez, J. Garcia Sole, Jose D. Jaque Garcia, *Nano Res.*, 8, 2015, 649-665. doi: 10.1007/s12274-014-0549-1.

2- Highly Cited Paper (WoS), 259 time cited: "NIR-to-NIR Two-Photon Excited  $\text{CaF}_2:\text{Tm}^{3+},\text{Yb}^{3+}$  Nanoparticles: Multifunctional Nanoprobes for Highly Penetrating Fluorescence Bio-Imaging", by: Dong, NN; Pedroni, M; Piccinelli, F; Conti, G; Sbarbati, A; Ramirez-Hernandez, JE; Maestro, LM; Iglesias-de la Cruz, MC; Sanz-Rodriguez, F; Juarranz, A; Chen, F; Vetrone, F; Capobianco, JA; Sole, JG; Bettinelli, M; Jaque, D; Speghini, A, *ACS Nano*, 5, 2011, 8665-8671. doi: 10.1021/nn202490m

3- Highly Cited Paper (WoS), 294 time cited: "Colloidal  $\text{Tm}^{3+}/\text{Yb}^{3+}$ -Doped  $\text{LiYF}_4$  Nanocrystals: Multiple Luminescence Spanning the UV to NIR Regions via Low-Energy Excitation", by: Mahalingam, Venkataramanan, Vetrone, Fiorenzo, Naccache, Rafik, Speghini, Adolfo, Capobianco, John A., *Adv. Mater.*, 21, 2009, 4025-4028. doi: 10.1002/adma.200901174

#### Top Italian Scientists, Via Academy

N. 83 of the list "Top Italian Scientists Chemistry",  
[http://www.topitalianscientists.org/TIS\\_HTML/Top\\_Italian\\_Scientists\\_Chemistry.htm](http://www.topitalianscientists.org/TIS_HTML/Top_Italian_Scientists_Chemistry.htm)

#### Patent

G. Ciuffreda, D. Segà, Z. Varanini, A. Zamboni, A. Speghini, (2018) "Processo, e relativo impianto, per l'ottenimento di nanoparticelle di fosfati contenenti nutrienti minerali essenziali per la nutrizione delle piante", P2850IT00

#### Oral communications at Conferences and Seminars (invited)

2019, September Oral Communication (Invited Speaker) at "8<sup>th</sup> International Workshop on Photoluminescence in Rare-Earths: Photonic Materials and Devices (PRE'19), Nice, France, with a presentation titled: "Lanthanide ions activated optical nanothermometers".

2019, June Invited Talk "Lanthanide activated nanomaterials: light in action" at the "Institute of Advanced Materials (INAM) - Department of Inorganic and Organic Chemistry", Universitat Jaume I, Castellón (Spain). Host: Prof. Beatriz Julián López.

2018, October Oral Communication (Keynote Speaker) at "Asian Conference on Nanoscience and Nanotechnology (AsiaNANO2018)", Qingdao, China, with a presentation titled: "Luminescent nanofluorides as nanothermometers and blood coagulation factors: an investigation on their interaction".

2018, July Oral Communication (Invited Speaker) at "International Conference on Energy, Materials and Photonics, EMP18", Montreal, Canada, with a presentation titled: " $\text{Nd}^{3+}$  activated fluoride nanoparticles for nanothermometry in the biological windows".

2017, October Invited Talk "Lanthanide activated alkaline-earth fluoride nanoparticles: biocompatible and multifunctional materials for nanomedicine", at National Institute of Scientific Research (INRS), University of Quebec, Varennes, Canada. Host: Prof. Fiorenzo Vetrone.

2017, August Oral Communication (Keynote Speaker) at "7<sup>th</sup> International Conference on Nanoscience and Technology (ChinaNANO 2017)", Beijing, China, with a presentation titled: "Lanthanide activated alkaline-earth fluoride nanoparticles: biocompatible and multifunctional materials for nanomedicine".

2016, October Oral Communication (Invited Speaker) at "Materials Science & Technology 2016 (MS&T16) Conference, Symposium on "Nanomaterials Working in the Near-Infrared: Biomedical Applications", Salt Lake City, Utah, USA, with a presentation titled: "Optical nanothermometers based on core@shell alkaline-earth nanoparticles activated with lanthanide ions".

2016, June Invited Talk "Lanthanide activated multifunctional nanostructures for biomedical applications", Department of Chemistry, State University of New York at Stony Brook, NY, USA. Host: Prof. Stanislaus Wong.

2016, June Oral Communication (Invited Speaker) at "6<sup>th</sup> International Workshop on Photoluminescence in Rare-Earths: Photonic Materials and Devices (PRE'16), Greenville, South Carolina, USA, with a presentation titled: "Lanthanide activated alkaline-earth fluoride nanoparticles: multifunctional probes for biomedical applications".

2016, May Oral Communication (Invited Speaker) at "Emerging Technologies: Communications, Microsystems, Optoelectronics, Sensors (ETCMOS)", Montreal, Canada, with a presentation titled: "Lanthanide activated core@shell alkaline-earth fluoride nanostructures as optical nanothermometers".

2014, August Oral Communication (Invited Speaker) at "XXIII International Materials Research Congress (IMRC), Symposium on Lanthanide-Doped Materials", Cancun, Mexico with a presentation titled: "Lanthanide doped alkaline-earth fluoride nanoparticles: biocompatible, multifunctional materials for biomedical imaging".

2014, June Oral Communication (Invited Speaker) at "1st International Conference on Fluorescent Up-converting Nanoparticles: a Platform for Energy and Biological Applications" (FUN-BIOENERGY)", Torremolinos, Spain, with a presentation titled: "Lanthanide doped core-shell alkaline-earth fluoride colloids: interesting optical probes for biomedical applications".

2013, October Oral Communication (Invited Speaker) at "Materials Science & Technology 2013 (MS&T13) Conference, Symposium on "Optical Nanomaterials for Photonics/Biophotonics", with a presentation titled: "Alkaline-earth based colloids for biomedical applications", Montreal, Canada.

2013, May Seminars at XIII<sup>th</sup> International Krutyn Summer School 2013- "Advanced photo- and electrically active molecular and nano-materials at the interface with living systems: challenges and promises for the future bio-medicine", Krutyn, Poland.

2011, October Invited Talk "Lanthanide doped nanocrystalline alkaline earth fluorides: synthesis, structural, morphological and spectroscopic investigation", Centro de Investigaciones en Optica (CIO), A. C., Leon, Gto., Mexico. Host: Prof. Elder De la Rosa.

#### Oral communications at Conferences

2019, May Oral Communication at " 2019 SPRING MEETING E-MRS ", Nice, France, with a presentation titled: "Lanthanide ions activated nanofluorides as optical nanothermometers in the biological window".

2018, September Oral Communication at "Advanced inorganic materials: green and unconventional synthesis approaches and functional assessment workshop", Department of Chemical Sciences, University of Padova, Italy, with a presentation titled: "Luminescent nanomaterials prepared by microwave-assisted hydrothermal synthesis: two interesting cases".

2018, September Oral Communication at "XLVI Congresso Nazionale di Chimica Inorganica", Bologna, Italy, with a presentation titled: "Luminescent nanofluorides (SrF<sub>2</sub>) as nanothermometers in the optical biological windows".

2017, November Oral Communication at "SHIFT 2017 (Spectral sHapIng For biomedical and energy applicaTions)", Tenerife, Spain, with a presentation titled: "NIR to Visible Upconversion of composite polymeric aerogels"

2017, September Oral Communication at "XXVI Congresso della Società Chimica Italiana", Pestum, Salerno, Italy, with a presentation titled: "Upconverting polymeric aerogels".

2016, September Oral Communication at "6th EuCheMS Chemistry Congress", Seville, Spagna, with a presentation titled: "Multi-shell approach: engineering lanthanide activated alkaline-earth fluorides towards more sensitive all-optical nanothermometers".

2016, September Oral Communication at "XLIV Congresso Nazionale di Chimica Inorganica", Padova, Italia, with a presentation titled: "Engineering lanthanide activated nanostructures towards efficient optical nanothermometers".

2015, June Oral Communication at "X Convegno INSTM sulla Scienza e Tecnologia dei Materiali", Favignana, Trapani, Italy, with a presentation titled: "Upconversion emission of Tm<sup>3+</sup>/Yb<sup>3+</sup> doped alkaline-earth fluoride nanoparticles as water colloids for light activated nanostructured systems".

2015, May Oral Communication at alla Conferenza "E-MRS 2015 SPRING MEETING", Lille, France, with a presentation titled: "Core-shell alkaline earth fluoride nanoparticles activated with Gd and Nd ions for multimodal bioimaging".

2014, July Oral Communication at Conferenza "17th International Conference on Luminescence and Optical Spectroscopy of Condensed Matter (ICL'14)", Wroclaw, Poland, with a presentation titled: "Lanthanide doped CaF<sub>2</sub> nanoparticles: biocompatible, multifunctional materials for biomedical imaging".

2014, May Oral Communication at "E-MRS 2014 SPRING MEETING", Lille, France, with a presentation titled: "Lanthanide doped core-shell alkaline-earth fluoride colloids: interesting optical probes for biomedical applications".

2013, May Oral Communication at "E-MRS 2013 SPRING MEETING", Strasbourg, France, with a presentation titled: "Co-encapsulation of CuInS<sub>2</sub>@ZnS Quantum Dots and Fe<sub>3</sub>O<sub>4</sub> Nanoparticles for multimodal imaging applications".

2013, April Oral Communication at "2013 MRS SPRING MEETING", San Francisco, California, USA, with a presentation titled: "Lanthanide Doped Alkaline Earth Fluoride Nanoparticles for Multimodal Optical and Magnetic Resonance Imaging".

2013, April Oral Communication at "EUFEN 2 f-Block", COST Action CM1006, Dublin, Ireland, with a presentation titled: "Upconverting gadolinium fluoride nanoparticles for multimodal imaging".

2012, August Oral Communication at "8th International Conference on f-Elements (ICFE-8)", Udine, Italy, with a presentation titled: "Lanthanide doped alkaline earth fluorides: a joint optical spectroscopy and EXAFS investigation".

2011, September Oral Communication at "X Convegno Nazionale Materiali Nanofasici", Bologna, Italy, with a presentation titled: "Upconverting lanthanide doped alkaline earth fluoride nanoparticles".

2008, September Oral Communication at "RARE EARTH MATERIALS (REMAT) - Advances in Synthesis, Studies and Applications", Karpacz, Poland, with a presentation titled: "Synthesis, characterization and optical spectroscopy of lanthanide doped nanocrystalline alkali niobates".

Verona, October 21st, 2019

SIGNATURE  
Prof. Adolfo Speghini

