



POLITECNICO
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Ph.D. School - Politecnico di Milano
Regulations of the Ph.D. Programme in:

MATERIALS ENGINEERING

Cycle XXXVIII

1. General Information

Ph.D. School - Politecnico di Milano

Ph.D. Programme: Materials Engineering

Course start: November 2022

Location of the Ph.D. Programme: Milano Leonardo

Promoter Department: Dipartimento di Chimica, Materiali e Ingegneria Chimica Giulio Natta

Scientific Disciplinary Sectors

- ING/IND 22 (09D1): Scienza e Tecnologia dei Materiali (“Materials Science and Technology”) (50%)
- ING/IND 21 (09D1): Metallurgia (“Metallurgy”) (10%)
- ING-IND/23 (09D2): Chimica Fisica Applicata (“Applied Physical Chemistry”)(5%)
- FIS-03 (02) Fisica della Materia (“Physics of matter”) (15%)
- CHIM-07 (03): Fondamenti Chimici delle Tecnologie (“Chemical Foundations of Technologies”) (15%)
- ING/IND-34 (09G2): Bioingegneria Industriale (“Industrial Bioengineering”) (5%)

Ph.D. School Website: <https://www.dottorato.polimi.it/>

Ph.D. Programme Website: <https://www.dottorato.polimi.it/corsi-di-dottorato/ingegneria/ingegneria-dei-materiali>

2. General presentation

The Ph.D. Programme in Materials Engineering provides high educational opportunities to young talents and executives who intend to become proactive professionals and researchers skilled in the design, production and application of both traditional and innovative materials, their optimization for specific applications, the prediction and assessment of their performance, and in developing new concepts and technologies in any materials-related fields.

Highlights of the Ph.D. Programme in Materials Engineering are:

- a rigorous scientific approach to address outstanding research
- an effective interdisciplinary approach
- connection with international leading scientific and technical communities
- a strong integration with the Doctorate School of Politecnico di Milano to increase knowledge with transversal courses, to gain soft skill and to join stimulating activities.

Materials Engineering involves the investigation of correlation among materials structure, processing and functional and structural properties, and the knowledge management from materials design to final applications.

Training consists of a three-year programme and requires the acquisition of 180 credits, 25 of which being obtained by attending Ph.D. level courses. PhD Courses provide both a fundamental background and a specialized qualification.

The Programme includes advanced research and training on:

- Research and development in traditional materials (polymers metals, ceramics, concretes, composites) and related technologies.
- Specific application areas: materials for energy, materials for environment, materials for electronics, optoelectronics and photonics, materials for cultural heritage, materials for product design, materials for packaging, biomaterials.
- Smart, responsive and self-healing materials, nanostructured materials.
- Materials corrosion and durability, life cycle assessment, coating and surface functionalization

The Ph.D. Programme is run by a Coordinator and a Faculty Board.

The Coordinator (see Attachment A1) chairs the Faculty Board, coordinates the preparation of the annual Educational Programme and organises the general educational activities of the Ph.D. courses.

The Faculty Board is responsible for the Educational programme, for supervision of the Ph.D. students research, and for teaching and related administrative activities (see Attachment A2).

Ph.D. Course in Materials Engineering received the appraisal of “Innovative Ph.D. Course” by the Italian Ministry of Education, Universities and Research.

3. Objectives

The objective of the Ph.D. Course in Materials Engineering is to educate proactive professionals aware of the correlation between the materials structure over several length-scales, the effects of processing on structure, and the final properties in use. This knowledge makes graduates skilled in the design, production and application of both traditional and innovative materials, their optimization for specific applications and the prediction and assessment of their performance and durability. From the list of topics reported in the general presentation, these skills may be acquired in several materials-related fields, all requiring a common multidisciplinary approach.

4. Professional opportunities and job market

The Ph.D. Programme in Materials Engineering aims at training Ph.D. laureates having a common background and specialized qualifications in advanced research areas. The knowledge and skills of a Ph.D. in Materials Engineering enable graduates to pursue their career in the Manufacturing industry given its quest for innovation in the production, processing, application and conservation of traditional materials and for the development of innovative materials allowing radically new, currently unforeseeable applications.

Moreover, the background deriving from full-time activity both in research and in education also qualifies the Ph.D. graduates for an academic career. Several former graduates from the Materials Engineering Programme have been able to secure post-doctoral research positions at high-ranking universities and research Institutes.

5. Enrolment

5.1 Admission requirements

Italian and International citizens can apply. They are requested to have graduated in accordance with the pre-existing laws D.M. 3.11.1999 n. 509, or to have a Master of Science degree in accordance with D.M. 3.11.1999 n. 509, or a Master of Science in accordance with D.M. 22.10.2004 n. 270, or similar academic title obtained abroad, equivalent for duration and content to the Italian title, with an overall duration of university studies of at least five years.

The certified knowledge of the English language is a further requirement for admission. Please refer to the Ph.D. School website for details.

Candidates apply to the admission announcement attaching the curriculum, a motivation letter, and an illustrative report about the development of a possible Ph.D. research, which will be evaluated by the members of a Committee.

5.2 Admission deadlines and number of vacancies

The number of positions is indicated in the Call for admission to the 38th Ph.D. cycle Programmes: <https://www.dottorato.polimi.it/>

Scholarships both on Open subjects and on specific themes are available, according to the Call for admission.

6. Contents

6.1 Requirements for the Ph.D. title achievement

The achievement of the Ph.D. title in Materials Engineering requires a full-time study and research activity of at least three years which is completed by the development and defense of the Ph.D. thesis.

Ph.D. candidates in Materials Engineering have to earn a minimum of 25 course credits (see paragraph 6.3 below), and to continuously carry out research.

At the beginning of his activity, the Faculty Board assigns a tutor to each Ph.D. candidate to supervise and assist her/him in the overall training programme. The tutor is a Member the Faculty Board. The tutors assist the candidates in the choice of courses to be included in the study plan, which is eventually submitted for approval to the Coordinator of the Ph.D. Programme (see also section 6.4 below).

The Faculty Board may assign to candidates extra course credits, in case they need to complete their preparation in specific topics, relevant for their research projects.

6.2 Research development

The main aim of all Politecnico di Milano Ph.D. Programmes is the development in the candidates of a research-oriented mind-set, with expertise and skills in a specific research topic. To this end, candidates acquire a problem-solving capability in complex contexts, including the ability of performing deep problem analysis, identifying original solutions, and evaluating their applicability in practical contexts.

These skills provide the Ph.D. candidates with major opportunities to develop and lead future research both in the academia, and in public and private organizations.

Ph.D. candidates are requested to give an original research contribution through publications and the Ph.D. thesis, which has to contribute to increase the knowledge in the candidate's research field. Besides, it must be consistent with the research topics developed in the Department where the Ph.D. Programme is carried out.

The Ph.D. thesis, in particular, collects the original research results of the candidate, in the context of the research state of the art in the specific research field.

The Ph.D. research is developed under the guidance of a supervisor, who supports the candidate in the setting-out of the research and in the everyday activities related to the thesis development. The supervisor is not necessarily a member of the Faculty Board and may also belong to an Institution different from Politecnico di Milano. The supervisor can be supported by one or more co-supervisors.

Further activities intended to develop the candidate's personal skills and research expertise are encouraged during the Ph.D. career.

Candidates must acquire the capability to present and discuss their work in their research community. Consequently, both the participation to international conferences and the publication of the research results in peer-reviewed journals are encouraged.

The Ph.D. Programme favors the candidates' research interactions with other groups in their research field, preferably abroad. Research visits of at least three months are strongly encouraged, as through them the candidates may acquire further skills to develop their research work and thesis.

The duration of the Programme is usually three years.

6.3 Objectives and general framework of the teaching activities

The Ph.D. Programmes and the Ph.D. School activate different teaching proposals, including courses, seminars, project workshops, laboratories. Teaching activities cover both basic research issues (problems, theories, methods), at the foundation of the Ph.D. Programme and its cultural context, and specialistic topics related to the subjects developed in the theses.

Lessons are usually held in English, except when otherwise stated. The Ph.D. Programme includes at least one complete study plan delivered in English language.

Structured teaching activities allow to earn ECTS credits. Other educational activities, for which an assessment process is difficult to implement do not allow to earn ECTS. However, they are reported and taken into account by the Faculty Board in the annual evaluation of the scientific and educational activities.

The Ph.D. School of Politecnico di Milano offers a set of courses aiming at training the Ph.D. candidates in soft and transferable skills. The skills and abilities provided by these courses are expected to help candidates across different areas of their careers making them able to react to the rapidly evolving needs of the global economy and society at large. The Ph.D. School courses activated for the 2022-2023 Academic Year are summarized in the following table

Table: Ph.D. School courses list. The list may be modified after the publication of the present document

Professor	Course title
Armondi Simonetta	Strengthening Critical Spatial Thinking
Balducci Alessandro	Approaches to Resilience: Social, Economic, Environmental and Technological Challenges of Contemporary Human Settlements
Biscari Paolo	English for Academic Communication
Biscari Paolo	Industrial skills
Biscari Paolo	Scientific communication in English
Brunetto Domenico	Innovative teaching skills
Canina Maria Rita	Creative design thinking
Cardilli Lorenzo	European Culture
Di Blas Nicoletta	Professional Communication
Fuggetta Alfonso	Project Management Basics
Iarossi Maria Pompeiana	Power of Images and Visual Communication for Research Dissemination
Mancini Mauro	Project Management (in Action)
Masarati Pierangelo	Ethical Aspects of Research on Dual-Use Technologies
Mauri Michele	Research Communication. Issue mapping: exploring public debates surrounding academic topics
Oppio Alessandra	How to support Complex decisions: Approaches and Tools
Ossi Paolo Maria	Sulla responsabilità della Tecnica
Oxoli Daniele	The Copernicus Green Revolution for Sustainable Development
Paganoni Anna Maria	La comunicazione nella Scienza
Pizzocaro Silvia Luisa	Practicing Research Collaboration / La pratica della collaborazione nella ricerca
Raos Guido	Science, Technology, Society and Wikipedia
Sancassani Susanna	Teaching Methodologies, Strategies and Styles
Sciuto Donatella	Research skills
Tanelli Mara	Cognitive biases and discriminations: implications, risks and opportunities
Volonte' Paolo Gaetano	Introduction to Academic Research

10 of the 25 course credits that each candidate is required to earn shall be obtained through soft and transferable skills courses organized by the Ph.D. School.

Every year the Ph.D. Programme in Materials Engineering activates Ph.D. level courses for at least 20 credits. The courses organized by the Ph.D. Programme in Materials Engineering are summarized in the following tables. For all courses, attendance is mandatory, and a final examination is required. Student evaluation can be carried out by means of either a written examination, written report, oral examination or seminar on a specific topic with final discussion. The evaluation method is described in each individual course syllabus as indicated by the professor in charge.

Course syllabus and schedule can be found on the website of the Ph.D. Programme in Materials Engineering. Course descriptions are also reported in the Study Programme (“Manifesto”) of the Ph.D. in Materials Engineering.

The table below summarizes the guidelines for the presentation of the candidate's study plan. At the same time, candidates will be involved in their research activity in a continuous way, under their supervisor’s guidance.

Courses	Possible details or reference to following tables	Number of credits
Courses characterising the Ph.D. Programme in materials engineering	See Table A	15 min
Ph.D. School Courses	See Table B	10 min

The Course activity of the Ph.D. candidate is expected to be concentrated in the first two years of his/her Ph.D. To be admitted to the second year, the Ph.D. student should have earned at least 10 credits by attending courses and passing the relevant examinations. Similarly, the Ph.D student should have acquired at least 20 of the 25 credits before starting the third year. Only a maximum of 5 credits should be attained during the third year (or possibly during the fourth year, in the case of prorogation, see 6.5).

Ph.D. Course List

Type A COURSES

The Ph.D. Programme in Materials Engineering offers the Characterizing Courses listed in table A. For the admission to the final exam the acquisition of 15 credits in this list is mandatory. The substitution of 5 of these credits with an equivalent number from other courses, e.g. deriving from extended research internships in other institutions, especially abroad, has to be approved by the Faculty Board of the Ph.D. Course in Materials Engineering before the course is attended.

The list of Ph.D. courses organized by the Ph.D. Programme in Materials Engineering is available at the website: <https://www.dottorato.polimi.it/corsi-di-dottorato/ingegneria/ingegneria-dei-materiali>

Type B COURSES

The Ph.D. School offers every year general and Interdoctoral courses. The acquisition of 10 credits is mandatory among the courses of B type. The list of Ph.D. courses organized by the Ph.D. School is available at the website <https://www.dottorato.polimi.it/en/phd-school/phd-level-courses>

PREPARATORY COURSES

If the supervisor and the tutor find useful or necessary that the candidate attends preparatory courses (chosen among the activated courses at the Politecnico di Milano), the Faculty Board of the Ph.D. Programme may assign some extra-credits to be acquired to complete the training. The Faculty Board will decide in advance if credits acquired in this way will concur to the mandatory 25 ECTS credits or will constitute an additional requirement.

SPECIALISTIC COURSES, LONG-TRAINING SEMINARS, SUMMER SCHOOLS

The attendance of Specialist Courses, Workshops, Schools, Seminars cycles is strongly encouraged and (if these seminars, workshops are certified and evaluated) may allow to acquire credits only if explicitly approved by the Faculty Board before the activity is attended. These courses and workshops can be added to the study plan, even if they are not evaluated (and therefore not qualified as credits), as optional “additional learning activity”.

The scheduled course planning for the academic year 2021-2022 follows. Other courses may be activated during the year. In this case, the candidates will be promptly informed and will be allowed to insert these new courses in their study plan.

Table A: PH.D. COURSES CHARACTERISING THE PH.D. PROGRAMME

Name of the Course	Professor	Language	Credits
Perspectives on materials investigation techniques (seminariale)	Andena Griffini Tommasini	English	5
Material characterization (with labs) Module 1(*): SEM, EDS, SRD, GDOES, Optical Microscopy, Laser Profilometry	Briatico V. F	English	5
Material characterization (with labs) Module 2 (*): NMR, FT-IR, RAMAN, DSC, DTA, TGA, AFM, STM	Castiglione F. Derudi M. Lucotti A. Casari C. (DENG)	English	5
Material characterization (with labs) Module 3 (*): Physico-mechanical characterization of materials (Contact angle determination, Indentation, Scratch, Dynamic Mechanical Analysis, Shear/Extensional Rheometry)	Briatico F. Griffini G. Gastaldi D. Andena L.	English	5
Simulation of molecular systems for chemistry, materials and biology	Tommasini	English	5
Interfacial Electrochemistry: structure and microscopic analysis of electrified interfaces	Bussetti Magagnin	English	5
The art of approximation in science and engineering	Bestetti	English	5
Phyton driving license	Raos Bruschi	English	5

(*) only one out of these three Courses can be inserted in the study plan

TABLE B: SUGGESTED CROSS –SECTORAL COURSES -. The list may be modified after the publication of the present document

Professor	Course title
Arondi Simonetta	Strengthening Critical Spatial Thinking
Balducci Alessandro	Approaches to Resilience: Social, Economic, Environmental and Technological Challenges of Contemporary Human Settlements
Biscari Paolo	English for Academic Communication
Biscari Paolo	Industrial skills
Biscari Paolo	Scientific communication in English
Brunetto Domenico	Innovative teaching skills
Canina Maria Rita	Creative design thinking
Cardilli Lorenzo	European Culture
Di Blas Nicoletta	Professional Communication

Fuggetta Alfonso	Project Management Basics
Iarossi Maria Pompeiana	Power of Images and Visual Communication for Research Dissemination
Mancini Mauro	Project Management (in Action)
Masarati Pierangelo	Ethical Aspects of Research on Dual-Use Technologies
Mauri Michele	Research Communication. Issue mapping: exploring public debates surrounding academic topics
Oppio Alessandra	How to support Complex decisions: Approaches and Tools
Ossi Paolo Maria	Sulla responsabilità della Tecnica
Oxoli Daniele	The Copernicus Green Revolution for Sustainable Development
Paganoni Anna Maria	La comunicazione nella Scienza
Pizzocaro Silvia Luisa	Practicing Research Collaboration / La pratica della collaborazione nella ricerca
Raos Guido	Science, Technology, Society and Wikipedia
Sancassani Susanna	Teaching Methodologies, Strategies and Styles
Sciuto Donatella	Research skills
Tanelli Mara	Cognitive biases and discriminations: implications, risks and opportunities
Volonte' Paolo Gaetano	Introduction to Academic Research

6.4 Presentation of the study plan

Ph.D. candidates must submit a study plan, which may be revised periodically (approximately every month), in order to suit possible changes in the course list or needs motivated by the development of their Ph.D. career. The study plans must be approved by the Ph.D. Programme Coordinator, according to the guidelines stated by the Faculty Board of the Ph.D. Programme.

6.5 Yearly evaluations

Candidates present their work to the Faculty Board at least once a year. In particular, the candidates must pass an annual evaluation in order to be admitted to the following Ph.D. year.

The third-year evaluation establishes the candidate's admission to the final Ph.D. defense.

As a result of each annual evaluation, the candidates who pass the exam receive an evaluation (A/B/C/D) and may proceed with the enrolment at the following year. Candidates who do not pass the exam are qualified either as “Repeating candidate (Er) ” or “not able to carry on with the Ph.D. (Ei)”. In the former case (Er), the candidates are allowed to repeat the Ph.D. year at most once. The Ph.D. scholarships – if any – are suspended during the repetition year. In the latter case (Ei) the candidates are excluded from the Ph.D. programme and lose their scholarships – if any.

In case the Faculty Board holds appropriate to assign directly an exclusion evaluation (Ei) without a previous repetition year, the request must be properly motivated, and validated by the Ph.D. School.

After the final year, candidates who have achieved enough results but need more time to conclude their research work and write their thesis, may obtain the admission to a further year. Normally, no additional scholarship will be provided for the additional year.

6.6 Ph.D. thesis preparation

The main objective of the Ph.D. career is the development of an original research contribution. The Ph.D. thesis is expected to contribute to the advancement of the knowledge in the candidate's research field.

The Ph.D. study and research work are carried out full time during the three years of the Ph.D. course. Stages or study periods in (Italian or International) companies or external Institutions may complete the candidate's preparation.

The resulting theses need to be coherent with the research issues developed in the Department where the Ph.D. Programme is developed.

The candidate must present an original thesis and discuss its contribution to the state of the art in the research field in the research community.

The Ph.D. research is developed following the lead of a supervisor, who supports the candidate in planning their research and in the everyday activities regarding the thesis development.

At the end of the Ph.D. studies, the Faculty Board evaluates the candidates work. Candidates who receive a positive evaluation submit their theses to two external reviewers for refereeing. If the evaluation provided by the reviewers is positive (or after the revisions required by the external reviewers), the candidates defend their thesis in a final exam, in front of a three members Committee (at least two of which must be external experts).

7. Laboratories, Ph.D. Secretary Services

Ph.D. candidates have access to the laboratories of research groups taking part in the Ph.D. Programme in Materials Engineering, which are located in the “G.Natta” Department of Chemistry, Materials and Chemical Engineering (CMIC), and in the Department of Energy. The facilities of the departmental laboratories at CMIC “Servizio di Analisi Microstrutturale dei Materiali” (SAMM), “Laboratorio Analisi Chimiche” (LAC), “Laboratorio grandi apparecchiature: NMR, MS e fotochimica organica” and “Laboratorio DCMC” are also available.

Ph.D. students can refer to the Secretariat of the Ph.D. Programme for any teaching or administrative issues:

Katia De Vettori - Lidia Martin

Email: PhD-IM@polimi.it

Telephone: +39-02-2399.4771

8. Internationalisation and inter-sectoriality

Carrying out study and research activities at external laboratories is strongly recommended.

Politecnico di Milano supports joint Ph.D. paths with International Institutions, as well as Joint and Double Ph.D. programmes. Further information is available on the Ph.D. School website and on the Ph.D. programme website.

More specifically, formal agreements are active between the Ph.D. Programme in Materials Engineering and:

- KATHOLIEKE UNIVERSITEIT LEUVEN (joint Ph.D. degree)
- XI'AN JIAOTONG UNIVERSITY (China)
- ECOLE NATIONALE SUPERIEURE DES MINES DE SAINT-ETIENNE (co-tutelle)
- PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE

Further Research collaborations (Ph.D. students exchanges, research stages, visiting professors) are active with the following Universities and Research Centres:

- MASSACHUSETTS INSTITUTE OF TECHNOLOGY, BOSTON (US)
- EIDGENSSISCHE TECHNISCHE HOCHSCHULE - ETH, ZURICH (SWITZERLAND)
- UNIVERSITE' D'EVRY VAL D'ESSONNE (FRANCE)
- CERN, GENEVE (SWITZERLAND)
- CERN, GRENOBLE (SWITZERLAND)
- SHEN ZHEN UNIVERSITY (CHINA)
- IMPERIAL COLLEGE OF SCIENCE, TECHNOLOGY AND MEDICINE (UK)
- LUNDS UNIVERSITET (SWEDEN)
- NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY (TRONDHEIM, NORWAY)
- UCLA UNIVERSITY OF CALIFORNIA (LOS ANGELES, US)
- LULEA TEKNISKA UNIVERSITET (SWEDEN)
- UNIVERSITE' CATHOLIQUE DE LOUVAIN (BELGIUM)
- FRIEDRICH-ALEXANDER-UNIVERSITY OF ERLANGEN-NUREMBERG (GERMANY)
- INSTITUT DE CHIMIE DE LA MATIERE CONDENSEE (BORDEAUX, FRANCE)
- MONTANUNIVERSITÄT LEOBEN (LEOBEN, AUSTRIA)

Interaction and collaboration with non-academic institutions provide significant benefits to both doctoral candidates as well as to research and innovation intensive institutions.

In particular, the Ph.D. Programme in Materials Engineering collaborates with the following Research Agencies and/or Industrial partners.

- APCE
- ENEA
- IIT FONDAZIONE ISTITUTO DI TECNOLOGIA
- INSTM
- INAF OSSERVATORIO ASTRONOMICICO DI BRERA
- INNOVHUB - AZIENDA SPECIALE INNOVHUB STAZIONI SPERIMENTALI PER L'INDUSTRIA DELLA CAMERA DI COMMERCIO DI MILANO

- LUXOTTICA
- NOVATEX S.P.A.
- RICERCA SISTEMA ENERGETICO - RSE S.P.A.
- STMICROELECTRONICS
- FATER S.P.A.
- ELECTROLUX PROFESSIONAL S.P.A.
- SOLVAY SPECIALTY POLYMERS
- ENI S.P.A
- LOGIC S.P.A.
- BM Plastics S.P.A
- SAVARE' I.C. srl

Attachment A1 – Ph.D. Programme Coordinator

Chiara Bertarelli received the degree in Industrial Chemistry in 1997 from the Università degli Studi di Milano (Milan, Italy). In 1998 awarded a post-laurea grant to attend the "Advanced School in Polymer Science G. Natta" at Politecnico di Milano and received the diploma with honors in 2000. She then awarded a PhD grant in Materials Engineering at Politecnico di Milano and got the diploma with honours in 2003. Visiting Professor at the Faculty of Textile Science & Technology of Shinshu University (JPN) in 2010 and at the ENS of Cachan (FR) in 2016. At present, is Full Professor in the Scientific Area of Materials Science and Technology.

Teaching Activities

She was lecturer of the courses "Organic Functional Materials", both in Italian (from 2003 to 2010) and in English (from 2005 to 2011), the course "Tecnologie dei Materiali Nanostrutturati" since 2010/2011 academic year, "Functional Materials" since 2011/2012 academic year, "Laboratorio di Sintesi Finale" since 2015. She was assistant lecturer within the course "Structure of Polymer Materials (from 2002 to 2004 and from 2006 to 2011) for students in Ingegneria dei Materiali. Moreover, she was invited to give lessons within the Doctoral Course of Electronic Engineering and post-laurea Master Courses on Materials for Cultural Heritage.

Management

She has held office in Council of the Department of Chemistry, Materials and Chemical Engineering of Politecnico di Milano from 2007 to 2010, in Faculty of the Doctoral Programme in Materials Engineering since 2011, and she is Coordinator of the same Doctoral Programme since the 2020. Member of the PhD School Council of Politecnico di Milano since the 2022. Is Team Leader of the Laboratory of Design and Synthesis of Functional and Nanostructured Materials of Politecnico di Milano.

ResearchActivities

The present research activities deal with the design and synthesis photochromic materials for smart optical devices, conjugated oligomers and polymers based on thiophene derivatives for optoelectronic devices and thermoelectric generators, and the development of functional nanofibers by electrospinning. The quality of the research activity is assessed by 135 Scopus publications and three reviews. She has $h_i = 27$ and a total number of citations of 2383 (Source Scopus, april 2022). She is co-inventor of a WO patent and an European patent, pending for other International Countries. The complete list of publications can be found at the ORCID website: <https://orcid.org/0000-0002-4577-0741>. She presented many notes at National and International Conferences and has several invited speeches.

Management of research projects

Has participated to many projects funded by the Italian Scientific and Technological Ministry (MIUR), by the Italian Foundation 'Fondazione Cariplo' and European Community. Among these, she was research line manager of the JRA6 in "Optical Infrared Coordinator Network for Astronomy (OPTICON)" FP6 (2004-2008) – In the 7th FP Framework, she is Person in charge of scientific and technical/technological aspects for Politecnico di Milano in the EU Project (OPTICON)" for 2009-2012 and for 2013-2015. In the H2020 she is Person in charge of scientific and technical/technological aspects for Politecnico di Milano in the new EU OPTICON Project. Project Coordinator of the project entitled "Orientation and segregation phenomena in electrospun hybrid polymer systems and in polymer blends" funded by INSTM (National Consortium of Materials Science and Technology) (2008-2009). Local Coordinator of the Projects entitled "Nanostructured MATerials for Innovative Hybrid Solar cells - MATHYS" (2010-2012) and "Inkjet printing of integrated organic optoelectronic devices: from molecular design to a digital X-ray imager (InDiXi) (2012-2014) funded by Fondazione Cariplo.

Attachment A2 – Ph.D. Faculty Board

Description of the composition of the Faculty Board

Name	Affiliation	Scientific Disciplinary Sector
Chiara Bertarelli (coordinator)	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	ING-IND/22
Francesco Briatico Vangosa (vice-coordinator)	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	ING-IND/22

Marco Beghi	Dipartimento di Energia	FIS/03
Massimiliano Bestetti	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	ING-IND/22
Fabio Bolzoni	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	ING-IND/22
Roberto Chiesa	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	ING-IND/22
Luigi De Nardo	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	ING-IND/22
Giovanni Dotelli	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	ING-IND/22
Fabio Ganazzoli	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	CHIM/07
Marinella Levi	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	ING-IND/22
Andrea Li Bassi	Dipartimento di Energia	FIS/03
Piero Macchi	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	CHIM/07
Luca Magagnin	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	ING-IND/23
Claudia Marano	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	ING-IND/22
Paolo Ossi	Dipartimento di Energia	FIS/03
Maria Pia Pedferri	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	ING-IND/22

Guido Raos	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	CHIM/07
Elena Redaelli	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	ING-IND22
Matteo Tommasini	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	ING-IND/22
Lucia Toniolo	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	ING-IND/22
Stefano Turri	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	ING-IND/22
Pasquale Vena	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	ING-IND/34

Attachment A3 – Ph.D. Advisory Board

Description of the composition of the Advisory Board

Name	Affiliation
Edoardo Bemporad	Dip. Ingegneria Meccanica e Industriale, Università Roma Tre
Marco Bernasconi	Dip. Scienza dei Materiali, Università Milano Bicocca
Federica Bondioli	Dip. Scienza dei Materiali e Ingegneria Chimica, Politecnico di Torino
Stefano Carminati	Eni SpA
Marco Ferrera	ST Microelectronics
Stefano Gialanella	Dip. Ingegneria Industriale, Università di Trento
Alessandro Martucci	Dip. Ingegneria Meccanica, Università di Padova
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