



**POLITECNICO**  
MILANO 1863

**PhD School - Politecnico di Milano**  
**Regulations of the PhD Programme in:**

Industrial Chemistry and Chemical Engineering

**Cycle XXXVII**

# 1. General Information

PhD School - Politecnico di Milano

PhD Programme: Industrial Chemistry and Chemical Engineering

Course start: November 2021

Location of the PhD Programme: Milano Leonardo

Promoter Department: Chemistry, Material and Chemical Engineering "G. Natta"

Scientific Disciplinary Sectors

- ING-IND/23 Applied physical chemistry
- ING-IND/24 Fundamentals of chemical engineering
- ING-IND/25 Chemical plants
- ING-IND/26 Analysis, design and control of chemical processes.
- ING-IND/27 Chemical technologies
- CHIM/07 Chemical foundations of technologies

PhD School Website: <http://www.polimi.it/phd>

PhD Programme Website: <http://phd.chem.polimi.it/>

Areas:

Area 03 - Chemistry

Area 09 - Industrial and information engineering

## 2. General presentation

The aim of the PhD is to develop a research-driven mentality through the acquisition of experience and skills in a specific research topic. This goal is pursued through the development of an original research contribution, presented through the PhD thesis. The whole activity is conducted according to the guidelines of a supervisor.

The general topic of the PhD in Industrial Chemistry and Chemical Engineering is the application of chemical, chemical-physical and engineering culture to all the activities related to the identification, synthesis, design, production and transformation of matter and energy. Basic disciplines are the necessary and fundamental tools. The goal of the PhD program is to provide students with tools for understanding, planning and managing processes and systems, but especially to develop new applications, design and feature new products and services. A variety of research topics are offered, including many areas of industrial chemistry and technology, such as: Catalysis and bio-catalysis; Biotechnology; Process development; Process safety; Food safety; Advanced materials; Human health;

Innovative and efficient energy technologies; Low-impact combustion processes; Design and conduct of systems optimizing the choice of raw materials, costs and sustainability thanks to methods derived from the big data analysis. Therefore, this study program involves not only the processes of synthesis and transformation of matter (in its broadest sense, from pharmaceuticals to materials), but also the places where these processes take place, which may be industrial plants in the proper sense (from laboratory experimentation up to industrial production including environmental concerns and safety), and natural environments (from the atmosphere to a reservoir where for instance chemical transformations of discharged pollutants take place, and the pharmacokinetics applied to the human body allows modelling and controlling the effect of a drug). In this context, the issues related to the lifecycle of the product (such as those related to quality of the product or interaction with the absorption-organ function-excretion of a drug) are also considered.

The PhD course is run by a Coordinator and a Faculty Board.

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

The Faculty Board is responsible for the Educational programme and for teaching and administrative activities related to the PhD course (see Attachment A2).

### 3. Objectives

The study of basic disciplines is seen as a necessary tool for the rationalization of technologies and of their rational, safe and sustainable use.

The training objective is not only trivially to provide the students with tools for the understanding, planning and management of processes and systems, but also to enable them to independently develop new technological applications and to design and characterize new products and new services with such characteristics.

The qualification of a PhD student is accomplished through the development of an original research work on a specific topic typical of the Industrial Chemistry and Chemical Engineering PhD.

A list of possible and specific topics includes:

- chemistry of natural compounds;
- catalysis and bio-catalysis;
- biotechnology;
- development of innovative chemical processes;
- food safety and quality assurance;
- advanced materials;
- human health;
- innovative energy technologies, with particular attention to energy consumption;
- development of combustion processes with low environmental impact, including the internal combustion engines;
- methodologies and criteria for process and plant design and operation, considering the choice of raw materials, the cost of the process, safety issues and sustainability

- design and control of operation units and of the whole plant through mathematical modelling and computer simulation techniques;
- study of processes at the microscopic scale, deepening the thermodynamics and kinetics and using other tools from electrochemistry and materials science;
- study of electrochemical processes in an interdisciplinary and multidisciplinary approach which involves the chemical and metallurgic engineering, material engineering and energetics;
- synthesis, characterization, process technology, and use of substances;
- design based on the structures of compounds of chemical and biological interest (synthesis, processing, use);

## 4. Professional opportunities and job market

Graduated PhDs in Industrial Chemistry and Chemical Engineering have a wide range of professional opportunities, including research positions in Universities and research institutions, as well as in chemical and in engineering companies and in numerous other industrial sectors. Different and specific activities, inside different sectors, can be found in the general context characterizing the Doctoral Program in Industrial Chemistry and Chemical Engineering. Accordingly, the Research Doctors will be able to find a natural location in process companies, and in private as well as public companies and institutes, operating in the field of research, design, production, formation, control and consultancy services.

## 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 requirement for admission. Please refer to the PhD School website for details.

The admission to the programmes will be established according to the evaluation of the candidates' curricula, motivation letters, and an illustrative report about the development of a possible PhD research, which candidates will send contextually with their application to the admission announcement.

### 5.2 Admission deadlines and number of vacancies

The number of positions is indicated in the Call for admission to the 37<sup>th</sup> PhD cycle Programmes: <http://www.polimi.it/phd>

Scholarships both on general and on specific themes are available, in accordance with what is specified in the call for admission.

## 6. Contents

### 6.1 Requirements for the PhD title achievement

The achievement of the PhD title in Industrial Chemistry and Chemical Engineering requires a study and research activity of at least three years equivalent of full time study, research and development of PhD thesis.

PhD candidates in Industrial Chemistry and Chemical Engineering must earn a minimum of 25 course credits (see paragraph 6.3 below), and to continuously conduct studies and research.

At the beginning of the course, the Faculty Board assigns a tutor to each PhD candidate to supervise and assist him/her in the overall training programme. The tutor shall be a professor belonging to 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 PhD Programme (see also section 6.4 below).

The Faculty Board may assign extra course credits to one or more candidates, 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 PhD 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 develop a problem-solving capability in complex contexts, including the capacity of performing deep problem analysis, identifying original solutions, and evaluating their applicability in practical contexts. These skills provide the PhD candidates with major opportunities of development in their research both in the academic field, and in public and private organisations.

PhD candidates are requested to develop an original research contribution. The PhD thesis must thus contribute to increase the knowledge in the candidate's research field. Besides, it has to be coherent with the research topics developed in the Department where the PhD Programme is carried out.

The original research results are collected in the PhD thesis, where the candidate's contribution is put in perspective with respect to the research state of the art in the specific research field.

The PhD research is developed under the guidance of a supervisor, who supports the candidate in the setting-out 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 PhD path.

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 PhD 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 normally three years.

### 6.3 Objectives and general framework of the teaching activities

The PhD Programmes and the PhD School activate teaching forms of different kind and credit value, including courses, seminars, project workshops, laboratories. Teaching activities both cover the basic research issues (problems, theories, methods), which represent the founding element of the PhD Programme and identify clearly its cultural position, and deepening in a specialist way some research issues connected with the problems developed in the theses.

Lessons are usually held in English, except when indicated otherwise. The PhD programme includes at least one complete path delivered in English language.

Structured teaching activities allow to earn ECTS credits. Other activities, typically specialized and for which it is difficult to evaluate the learning and its quantification, fall within the scientific activities and are taken into account by the Faculty Board in the overall evaluation, but they do not allow to earn ECTS.

The PhD School of Politecnico di Milano proposes a set of courses aiming to train the PhD 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 in order to respond to the rapidly evolving needs of the global economy and society at large. The PhD School courses activated for the 2021-2022 Academic Year are summarized in the following table.

Professor	Course title
Aliverti Andrea	Ethics in Research
Armondi Simonetta	Strengthening Critical Spatial Thinking
Arnaboldi Michela	Advanced Interaction Skills for Academic Professionals
Balducci Alessandro	Approaches to Resilience: Social, Economic, Environmental and Technological Challenges of Contemporary Human Settlements
Biscari Paolo	English for Academic Communication
Cardilli Lorenzo	European Culture
Chiodo Simona	Epistemology of Scientific and Technological Research (Technologies Reshaping Humans)
Di Blas Nicoletta	Professional Communication
Gianinetto Marco	The Copernicus Green Revolution for Sustainable Development
Iarossi Maria Pompeiana	Power of Images and Visual Communication for Research Dissemination
Jacchetti Emanuela	Communication Strategies that Score in Worldwide Academia
Lavagna Monica	Sustainability Metrics, Life Cycle Assessment and Environmental Footprint
Mancini Mauro	Project Management (in Action)
Masarati Pierangelo	Ethical Aspects of Research on Dual-Use Technologies
Ossi Paolo Maria	Sulla responsabilità della Tecnica
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
Valente Giovanni	Scientific Reasoning: Philosophy, Logic and Applications

Volonte' Paolo Gaetano	Introduction to Academic Research
Zani Maurizio	Laboratorio di insegnamento a classi numerose

At least 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 PhD School.

Each PhD student is asked to attend the following courses: i) at least 1 course of 5 credits chosen among those offered by the *Industrial Chemistry and Chemical Engineering (CII)* doctoral program; The seminar course entitled 'Chemical Engineering Frontiers', which is made up of a series seminars kept by high profile scientists or researchers, is mandatory. The seminars will be given in the course of the whole three years of the PhD program. ii) at least 2 courses of 5 credits chosen among those offered by the Politecnico PhD school; iii) the remaining courses can be chosen among those offered by the CII doctoral program, the PhD school or the MS programs offered by Politecnico di Milano. One international school can also be attended: its length should be three days (minimum) and a certificate of attendance should be provided. The detailed list of courses can be found on the website <http://www.dottorato.polimi.it/en/phd-programmes/active-phd-programmes/industrial-chemistry-and-chemical-engineering/>.

The tables below summarize the candidate's path (as regards coursework activities). At the same time, the programme foresees that the candidates are devoted to research activity in a continuous way, following the lead of their supervisors, and of the Faculty Board.

#### *First/Second Year*

<b>Courses</b>	<b>Possible details or reference to following tables</b>	<b>Number of credits (25)</b>	<b>Note</b>
PhD School Courses	See Table B	10÷20	
Courses characterising the PhD Programme	See Table A	5÷15	
Other PhD courses / MS program		0÷5	See courses offered by the other PhD programs at Politecnico: <a href="http://www.dottorato.polimi.it/en/phd-programmes/active-phd-programmes/">http://www.dottorato.polimi.it/en/phd-programmes/active-phd-programmes/</a>
International School		0÷5	Certificate of attendance needed. Minimum duration 3 days.

#### *Third year*

In the third year the candidate should be devoted entirely to the research and to the development of the PhD thesis.

## PhD Course List

**A)** The PhD Programme in Industrial Chemistry and Chemical Engineering organises the **Characterising Courses** listed in table A.

For the admission to the final exam the acquisition of at least 5 credits in this list is **mandatory**.

**B)** The PhD School organises every year general and Interdoctoral courses. The acquisition of **at least 10 credits** is **mandatory** among the courses of B type. The list of PhD courses organized by the PhD School is available at the website <http://www.dottorato.polimi.it/en/during-your-phd/phd-school-courses>

### **C) Other PhD courses**

A maximum of 10 mandatory credits can be obtained by choosing among courses provided by other PhD programmes at Politecnico di Milano. Additionally, these 10 credits can also be obtained attending an international school (5 credits) and/or courses offered by Politecnico di Milano, chosen among those offered inside Master of Science programs.

### **PREPARATORY COURSES** (only if foreseen)

If the supervisor and the tutor find it useful or necessary that the candidate attends preparatory courses (chosen among the activated courses at the Politecnico di Milano) the Faculty Board of the PhD programme may assign some extra-credits to be acquired to complete the training path. The credits acquired in this way will be considered as additional, in relation to the mandatory credits to be acquired with the PhD courses.

### **SPECIALISTIC COURSES, LONG-TRAINING SEMINARS**

The attendance of Specialist Courses, Workshops, Schools, Seminars cycles is strongly encouraged. The attendance to schools (certificate of attendance needed, minimum duration 3 days) may permit to acquire 5 credits according the modalities established by the Faculty Board concerning the evaluation. Courses and workshops can be inserted in the study plan, even if they are not evaluated (and therefore not qualified as credits), as optional “additional teaching”.

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: PHD COURSES CHARACTERISING THE PHD PROGRAMME**

<b>Name of the Course</b>	<b>Professor</b>	<b>Academic Year</b>	<b>Language</b>	<b>Credits</b>
Chemical Engineering Frontiers	Alessio Frassoldati	2021-2022	English	5
Chemical Development and Scale-up of Fine Chemicals	Elisabetta Brenna	2021-2022	English	5
Structured Catalysts & Reactors	Enrico Tronconi	2021-2022	English	5

	Matteo Ambrosetti			
Advanced analytical methods and data analysis	Andrea Mele	2021-2022	English	5
Data science in Chemical Engineering	Alberto Cuoci Matteo Maestri Barbara Pernici Piercesare Secchi Alessandro Stagni	2021-2022	English	5
Structural characterization of nanomaterials	Francesca Baldelli Bombelli Giancarlo Terraneo Claudia Pigliacelli	2021-2022	English	5

**Table B SUGGESTED CROSS –SECTORAL COURSES**

Name of the Course	Professor	Academic year	Language	Credits
Ethics in Research	Aliverti	2021-2022	English	5
Strengthening Critical Spatial Thinking	Armondi	2021-2022	English	5
Advanced Interaction Skills for Academic Professionals	Arnaboldi	2021-2022	English	5
Approaches to Resilience: Social, Economic, Environmental and Technological Challenges of Contemporary Human Settlements	Balducci	2021-2022	English	5
English for Academic Communication	Biscari	2021-2022	English	5
European Culture	Cardilli	2021-2022		
Epistemology of Scientific and Technological Research (Technologies Reshaping Humans)	Chiodo	2021-2022	English	5
Professional Communication	Di Blas	2021-2022	English	5
The Copernicus Green Revolution for Sustainable Development	Gianinetto	2021-2022	English	5
Power of Images and Visual Communication for Research Dissemination	Iarossi	2021-2022	English	5
Communication Strategies that Score in Worldwide Academia	Jacchetti	2021-2022	English	5
Sustainability Metrics, Life Cycle Assessment and Environmental Footprint	Lavagna	2021-2022	English	5

Project Management (in Action)	Mancini	2021-2022	English	5
Ethical Aspects of Research on Dual-Use Technologies	Masarati	2021-2022	English	5
Sulla responsabilità della Tecnica	Ossi	2021-2022	Italian	5
La comunicazione nella Scienza	Paganoni	2021-2022	Italian	5
Practicing Research Collaboration / La pratica della collaborazione nella ricerca	Pizzoccaro	2021-2022	English/ Italian	5
Science, Technology, Society and Wikipedia	Raos	2021-2022	English	5
Teaching Methodologies, Strategies and Styles	Sancassani	2021-2022	English	5
Scientific Reasoning: Philosophy, Logic and Applications	Valente	2021-2022	English	5
Introduction to Academic Research	Volontè	2021-2022	English	5
Laboratorio di insegnamento a classi numerose	Zani	2021-2022	Italian	5

## 6.4 Presentation of the study plan

PhD candidates must submit a study plan, which may be revised periodically (approximately every three months), in order to adequate them to possible changes in the course list, or to needs motivated by the development of their PhD career. The study plans must be approved by the PhD programme Coordinator, according to the modalities established by the Faculty Board of the PhD Programme itself.

## 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 PhD year. The third year evaluation establishes the candidate's admission to the final PhD 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 PhD (Ei)”. In the former case (Er), the candidates are allowed to repeat the PhD year at most once. The PhD scholarships – if any – are suspended during the repetition year. In the latter case (Ei) the candidates are excluded from the PhD 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 PhD School.

After the final year, candidates who have achieved sufficient results but need more time to conclude their research work and write their theses, may obtain the admission to a further year.

## 6.6 PhD thesis preparation

The main objective of the PhD career is the development of an original research contribute. The PhD thesis is expected to contribute to the advance of the knowledge in the candidate's research field.

The PhD study and research work is carried out, full time, during the three years of the PhD 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 PhD programme is developed.

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

The PhD research is developed following the lead of a supervisor, who supports the candidate in the setting out and in the everyday activities regarding the thesis development.

At the conclusion of the PhD studies, the Faculty Board evaluates the candidates. 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 Committee composed of three members (at least two of which must be external experts).

## 7. Laboratories, PhD Secretary Services

PhD students in Industrial Chemistry and Chemical Engineering can attend the laboratories of the Department of Chemistry, Materials and Chemical Engineering (<http://www.chem.polimi.it/>) and those of the Laboratory of Catalysis and Catalytic Processes (<http://www.lccp.polimi.it/>) at the Energy Department.

PhD Secretary Services: Katia De Vettori

Email: [Phd-CIIC@polimi.it](mailto:Phd-CIIC@polimi.it)

Phone: +39 0223994771

## 8. Internationalisation and inter-sectoriality

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

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

More specifically, the PhD programme in Industrial Chemistry and Chemical Engineering collaborates and has active joint PhD paths with Université Libre de Bruxelles ULB (Belgium), INPT Toulouse (France), Delft University (Netherlands) and ETH Zurich (Switzerland).

The collaboration with Delft is part of the Marie Curie project "Codobio" (<https://www.codobio.eu/>). This project started during 2019 and will be carried out over a period of 4 years. The main objective is to deliver a new generation of creative, entrepreneurial, highly-skilled and innovative Early Stage Researchers (ESRs) that are able to face the future transition challenges and to greatly contribute to the knowledge-based economy and digitized environment in manufacturing and society in general. In the proposed research programme, the most urgent questions in continuous downstream processing will be addressed: Process control and modelling; miniaturization, scale-up and scale-down of; process design and development of integrated continuous downstream processes. The network consists of 6

academic and 3 industrial beneficiaries, and numerous partners from 9 different countries in Europe. Additional collaborations are also active with ULB are in the fields of safety engineering, combustion biopolymers and supramolecular chemistry. Two agreements were recently signed for double doctorate students between ULB and Politecnico.

A co-tutelle doctorate agreement has been signed with the Institut National Polytechnique of Toulouse (INPT). The research activities involved in this cooperation are relevant topics in industrial and process engineering, such as Optimal design of flexible and operable biorefinery processes.

The PhD program is also frequently involved in numerous collaborations with international universities and research centers, often as project partners inside European programs (FP7, H2020 etc.) or with dedicated joint projects. As a matter of example, a brief list of other international universities with which the PhD program maintains systematic research collaborations is:

ETH Zurich	Switzerland	Numerous collaborations, which include joint publications, and exchange of PhD students and faculties. Partner of the Marie Curie program "Codobio".
Stanford University	USA	Numerous collaborations, which include joint publications, and exchange of PhD students and faculties.
MIT Boston	USA	Numerous collaborations, which include joint publications, and exchange of PhD students and faculties supported by the "Progetto Rocca MIT-Politecnico"
Cambridge University	UK	Numerous collaborations, which include joint publications, and exchange of PhD students and faculties.
Ghent University	Belgium	Joint research activities inside EU H2020 projects, and previous Marie Curie programs.
Delft University	The Netherlands	Numerous different joint research activities, usually associated to ongoing EU H2020 projects, and Marie Curie program "Codobio".
Université Libre de Bruxelles	Belgium	Collaborations and co-tutelle PhD positions are active with ULB in the fields of safety engineering, combustion biopolymers and supramolecular chemistry.

Interaction with and exposure to non-academic sectors provides significant benefits to doctoral candidates as well as to research and innovation intensive employment sectors. Direct exposure to the challenges and opportunities in non-academic sectors of the economy and society at large is fostered by networking, connectivity, inter-sectoral mobility and wide access to knowledge. In particular, the PhD programme in Industrial Chemistry and Chemical Engineering collaborates with the following Research Agencies and/or Industrial partners.

Pirelli Tyre SpA: Pirelli Tire SpA part of the Pirelli Group and is one of the largest operator in the tyre market worldwide, particularly in high range segments with a high technological content. This company therefore invests significantly in R&D, and has collaborations with several universities and research centres, depending on the various specializations and the numerous research themes that are relevant for the tyre technology field. Joint research activities are carried out both in the company laboratories in the CMIC department of Politecnico, on the basis of the agreement between Pirelli for the PhD program in Industrial Chemistry and Chemical Engineering of Politecnico di Milano.

Humanitas collaborates with the PhD programme in Industrial Chemistry and Chemical Engineering on research about the role of the physicochemical microenvironment in biofilm formation structure-function relationships in both chemical and biological systems. Both partners provided funding for several scholarships to the PhD program in Industrial Chemistry and Chemical Engineering.

ENI SpA supports different PhD positions in the PhD programme in Industrial Chemistry and Chemical Engineering, promoting researches on biomass pyrolysis and plastic waste recycle, reforming processes and and vapor-liquid equilibria of mixtures involved in biofuel production. Moreover, the engineering company Jacobs collaborates with the PhD programme in Industrial Chemistry and Chemical Engineering on research about chromatographic processes. Finally, the pharmaceutical company Bracco SpA collaborates with the PhD programme in Industrial Chemistry and Chemical Engineering with the direct support of two PhD positions on the synthesis of innovative contrasting agents.

# Attachment A1 – PhD Programme Coordinator

Prof. Alessio Frassoldati, full Professor at Politecnico di Milano, Department of Chemistry, Materials and Chemical Engineering “G. Natta”

E-mail: [alessio.frassoldati@polimi.it](mailto:alessio.frassoldati@polimi.it)

Master Degree in chemical engineering at Politecnico di Milano in 1999. PhD in Chemical Engineering at Politecnico di Milano in 2004. Visiting Scholar at the Center for Energy Research (CER) - University of California, San Diego in 2003.

## TEACHING ACTIVITY

Teaching activities for students in safety engineering and chemical engineering (unit operations, error analysis, fire safety). Teaching activity in national and international schools for PhD students in the field of combustion.

## RESEARCH ACTIVITY

The scientific production includes about 130 papers on international journals, more than 100 contributions in proceedings of international congresses and a patent (EP2592362A1). The research topics are related to detailed kinetic and fluidynamics analysis of combustion processes, including renewable fuels, the evaluation of pollutant formation and safety.

## AWARDS

Sugden Award (2013) assigned by the "British Section of The Combustion Institute".

The Research Excellence Award (2020) assigned by the "The Combustion Institute".

## SERVICE

-Member of PhD Board at Politecnico di Milano and responsible of the coordination of the PhD programme in Industrial Chemistry and Chemical Engineering.

-Members of the Silver medal Committee of the International Combustion Institute, year 2020.

-Member of the Board of the Italian Section of the Combustion Institute.

-Members for the Bernard Lewis Fellowship Committee of the International Combustion Institute, years 2014, 2016, 2018.

## RECENT RESEARCH PROJECTS FUNDED

- 2017-2020. H2020 H2020-MG-2016-2017 project Jetscreen (723525): JET Fuel SCREENing and Optimization. Role: leading participant 200 keuro.
- 2016-2020. H2020-IND-CE-2016-17 project IMPROOF (723706): Integrated model guided process optimization of steam cracking furnaces. Role: participant, 514 keuro.
- 2016-2020. H2020 H2020-LCE-2015 project Residue2Heat: Renewable residential heating with fast pyrolysis bio-oil. Role: participant and WP leader, 330 keuro.
- 2014-2018. MSCA-ITN-2014-EJD Horizon 2020 grant nr. 643134: Clean Gas (Combustion for Low Emission Applications of Natural Gas). Role: participant, total grant 3730 keuro (Polimi grant 1015 keuro). Involved partners: Technische Universität Darmstadt, CentraleSupélec, Université Libre de Bruxelles, Ansaldo, Rolls-Royce, Numeca, TIME association.

## RECENT INDUSTRY GRANTS

2020. MORE srl: H2 and H2/CH4 oxy-combustion.

2020. Technital SpA: Risk Analysis for Immersed Tunnel.

2019. Brembo SpA: Fluidynamic and kinetic study of industrial and lab-scale (CVI) reactors.

2018. Brembo SpA: Fluidynamic and kinetic study of Standard (CVI) reactors.

2017. Brembo SpA: Fluidynamic study of Chemical Vapor Infiltration (CVI) reactors.

2016. Brembo SpA: Modelling of Chemical Vapor Infiltration (CVI) reactors.

2015. KT-Kinetics Technology: Study of the Thermal Incinerator installed in a Sulphur Recovery Unit.

2014. Polaris srl: Evaluation of flammability limits of gaseous mixtures.

## Attachment A2 – PhD Faculty Board

Description of the composition of the Faculty Board

Name	Affiliation	Scientific Disciplinary Sector
Frassoldati Alessio (coordinator)	Politecnico di Milano	ING-IND/25 Chemical plants
Beretta Alessandra	Politecnico di Milano	ING-IND/27 Chemical technologies
Bozzano Giulia	Politecnico di Milano	ING-IND/24 Fundamentals of chemical engineering
Brenna Elisabetta	Politecnico di Milano	CHIM/07 Chemical foundations of technologies
Busini Valentina	Politecnico di Milano	ING-IND/24 Fundamentals of chemical engineering
Cavallotti Carlo	Politecnico di Milano	ING-IND/24 Fundamentals of chemical engineering
Cellesi Francesco	Politecnico di Milano	ING-IND/23 Applied physical chemistry
Cuoci Alberto	Politecnico di Milano	ING-IND/24 Fundamentals of chemical engineering
Galimberti Maurizio	Politecnico di Milano	CHIM/07 Chemical foundations of technologies
Gatti Francesco	Politecnico di Milano	CHIM/06 Organic chemistry
Lietti Luca	Politecnico di Milano	ING-IND/27 Chemical technologies
Manca Davide	Politecnico di Milano	ING-IND/26 Analysis, design and control of chemical processes
Maestri Matteo	Politecnico di Milano	ING-IND/27 Chemical technologies
Mele Andrea	Politecnico di Milano	CHIM/07 Chemical foundations of technologies
Mehl Marco	Politecnico di Milano	ING-IND/25 Chemical plants
Metrangolo Pierangelo	Politecnico di Milano	CHIM/07 Chemical foundations of technologies
Morbidegli Massimo	Politecnico di Milano	ING-IND/23 Applied physical chemistry
Moscatelli Davide	Politecnico di Milano	ING-IND/23 Applied physical chemistry
Nova Isabella	Politecnico di Milano	ING-IND/27 Chimica Industriale e Tecnologica
Punta Carlo	Politecnico di Milano	CHIM/07 Chemical foundations of technologies
Resnati Giuseppe	Politecnico di Milano	CHIM/07 Chemical foundations of technologies
Sironi Selena	Politecnico di Milano	ING-IND/23 Applied physical chemistry
Terraneo Giancarlo	Politecnico di Milano	CHIM/07 Chemical foundations of technologies
Tronconi Enrico	Politecnico di Milano	ING-IND/27 Chemical technologies

## Attachment A3 – PhD Advisory Board

Description of the composition of the Advisory Board

<b>Name</b>	<b>Affiliation</b>
Margherita Albano	Solvay Specialty Polymers
Paolo Pollesel	ENI S.p.A.
Paolo Vacca	SAES-Getters S.p.A
Vincenzo Guida	Procter & Gamble
Dario Lazzari	Miteni
Raffele Ostuni	Casale SA (Switzerland)
Renato Paludetto	Dow
Gianmarco Polotti	Data How A.G. (Switzerland)

Each year the Advisory Board attends the new edition of the “PhD day” of the PhD in Industrial Chemistry and Chemical Engineering, where they produce a report about the students’ work and assign a prize to the best thesis.