

CURRICULUM VITAE – MATTEO GHERARDI

PERSONAL DATA

Date and place of birth: 09/09/1985 – Bologna, Italy

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EDUCATION AND PROFESSIONAL CAREER

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| 10/2004-10/2007 | Bachelor in Energy and Nuclear Engineering cum laude, Università di Bologna |
| 10/2007-10/2009 | Master in Energy and Nuclear Engineering cum laude, Università di Bologna |
| 1/2010-12/2012 | PhD in Mechanical Engineering, Alma Mater Studiorum - University of Bologna. <i>PhD dissertation: Integrated analysis and design of optimization and up-scaling of inductively coupled plasma synthesis of nanoparticles.</i> |
| 1/2013-3/2015 | Postdoctoral fellow, Department of Industrial Engineering, Università di Bologna. |
| 2-7/2013 and 2-7/2015 | Adjunct professor for the course <i>Laboratory of Industrial Applications of Plasmas</i> , master degree in Energy Engineering, Università di Bologna |
| 5/2013-to date | Founder and member of advisory board (up to 2019) of <i>AlmaPlasma srl</i> , spin-off company of Università di Bologna |
| 4/2015-3/2018 | Junior assistant professor, Department of Industrial Engineering, Università di Bologna |
| 4/2018-3/2021 | Senior assistant professor, Department of Industrial Engineering, Università di Bologna |
| 2021-to date | Associate professor, Department of Industrial Engineering, Alma Mater Studiorum - University of Bologna |

RESEARCH ACTIVITIES

Profile

MG scientific activity is focused on the development of innovative plasma technologies and their applications in industrially and socially relevant fields, unraveling the underlying fundamental aspects with the aim of understanding, controlling and optimising processes. MG expertise is rooted in plasma engineering and physics (design and optimization of plasma systems and processes, plasma diagnostics) and his main research interests are i) equilibrium and non-equilibrium plasmas at atmospheric or sub-atmospheric pressures, ii) material processing, iii) plasma application in the agrifood and medical fields, iv) plasma characterization and v) development of monitoring and control strategies for plasma processes.

MG most recent research activities deal with i) thin film deposition for developing antimicrobial surfaces, ii) development of energy-based and chemistry-based control strategies for plasma processes, iii) investigation of plasma-aerosol systems, iv) design of plasma-based technologies for COVID containment and v) up-scaling of plasma systems.

MG has been a member of the research group for industrial applications of plasmas (<http://plasmagroup.ing.unibo.it>) at Università di Bologna since 2009, of the International Plasma Chemistry Society since 2011 and of the International Society of Plasma Medicine since 2012.

| Years | Funded research projects and covered role |
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| From: 2022 To: 2024 | NRPP-NextGenerationEUONFOODS - Research and innovation network on food and nutrition Sustainability, Safety and Security – Working ON Foods. Role covered: <u>task leader</u> (Innovative technologies for sanitization of fresh food products); project value: 128.5M€ (overall budget) |
| From: 2023 To: 2025 | HORIZON-EIC, PULSE - Plasma reconfigurable metaSurface technologies. ID 101099313. Role covered: <u>WP leader</u> ; project value: 400 k€ |
| From: 2022 To: 2023 | ALMAIDEA DEMOPLASMA. Topic: plasma decontamination of foods. ID: J33C22001420001. Role covered: <u>project leader</u> ; project value: 24 k€ |
| From: 2022 To: 2023 | INDUSTRIAL PROJECT. Topic: techno-economic analysis of plasma assisted processes for hydrogen production and CCUS. Role covered: <u>project leader</u> ; project value: 35 k€ |
| From: 2022 To: 2022 | INDUSTRIAL PROJECT. Topic: aerosol-assisted plasma deposition of fluorinated silicon-containing coatings for antibacterial applications. Role covered: <u>project leader</u> ; project value: 12 k€ |
| From: 2021 To: 2021 | INDUSTRIAL PROJECT. Topic: design-oriented modeling for the optimization of components of plasma arc cut torches. Role covered: <u>project leader</u> ; project value: 25 k€ |
| From: 2020 To: active | COST ACTION CA19110 Plasma applications for smart and sustainable agriculture , european networking project. Topic: investigate the potential of low temperature plasmas (cold plasmas) as i) a green alternative to conventional chemicals in agriculture to improve yields, increase size and robustness of plants and to reduce (or eliminate) the need for antifungal agents and as ii) an innovative technology in the food processing chain for the treatment of food and packaging. Role: <u>MC member and work group leader</u> |
| From: 2020 To: 2021 | Virus Killer: dispositivo di sanificazione a contrasto del trasporto indoor di bioaerosol Topic: development of plasma technologies for the microbial inactivation of bioaerosols. ID: J41F20000090009. Role covered: <u>participant and project leader</u> ; project value: 117 k€ |
| From: 2020 | EIT FOOD PASS plasma-assisted sanitation systems Topic: design of plasma-assisted sanitation |

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| To: 2020 | systems for packaging, equipment and tools used in the processing and handling of food products as a barrier to viruses and bacteria. Role covered: <u>participant and DIN project leader</u> ; project value: 144 k€ |
| From: 2019 To: active | H2020-MSCA-RISE-2019 – “GREEN MAP” Topic: Novel Green polymeric materials for medical packaging and disposables to improve hospital sustainability. Role covered: <u>departmental project leader</u> ; project value: 35k€ |
| From: 2019 To: active | Atmospheric low temperature plasmas (LTPs) activation of water for agricultural applications and food processing , Projects for exchange of researchers selected within the frame of the executive programme of scientific and technological cooperation between the Italian republic and the republic of Serbia for the years 2019-2021. ID: M03156. Role covered: <u>project coordinator</u> |
| From: 2019 To: 2022 | PLASMAFOOD , PRIN 2017 national project. Topic: study and optimization of cold atmospheric plasma treatment for food safety and quality improvement. Role: <u>participant</u> |
| From: 2018 To: 2019 | INDUSTRIAL PROJECT . Topic: deposition of SiO ₂ -like films for improving the barrier properties of polymeric packaging. Role covered: <u>project leader</u> ; project value: 24 k€ |
| From: 2016 To: 2019 | COST ACTION CA15114 Anti-Microbial Coating Innovations to prevent infectious diseases (AMICI) , european networking project. Topic: Evaluate the impact of introducing anti-microbial coatings in healthcare on the spread of infections and on the efficacy in fighting HealthCare Associated Infection and bacterial resistance to current antibiotics. Role: MC substitute |
| From: 2016 To: 2019 | ECOPACKLAB , POR-FESR 2014-2020 regional project. Topic: Design and realisation of a laboratory for the study of advanced technologies for the production of active and ecosustainable packaging. Role: <u>participant</u> |
| From: 2016 To: 2019 | TECNO_EN-P , POR-FESR 2014-2020 regional project. Topic: Design and realisation of a system to generate smart materials for biomedical devices to selectively remove cells and soluble or suspended matter in biological fluids. Role: <u>participant</u> |
| From: 2015 To: 2019 | NOTHEPIAS , SIR 2014 national project. Topic: Evaluation of non-thermal plasma as an innovative anticancer strategy Role: <u>participant</u> |
| From: 2015 To: 2019 | INDUSTRIAL PROJECT . Topic: Electrical, physical and chemical characterization and analysis of the antibacterial effectiveness of lab-scale atmospheric plasma sources for the decontamination of packaging films. Role: <u>project leader</u> ; project value: 200 k€ |
| From: 2015 To: 2019 | INSPIRED , european H2020 grant. Topic: Scale up to an industrial scale of the plasma assisted production of nanomaterials for nano-inks. The opening of the assistant professorship is related to the project approval by the EU. Role: <u>participant</u> |
| From: 2013 To: 2017 | COST ACTION TD1208 Electrical discharges with liquids for future applications , european networking project. Topic: Investigate the fundamental mechanisms of the interaction between plasma and liquids and develop innovative and interdisciplinary applications. Role: MC substitute |
| From: 2013 To: 2016 | PLASMAT , FARB grant (fundamental research funding from Alma Mater Studiorum - Università di Bologna). Topic: Intensify the understanding of the fundamental mechanisms of plasma interaction with molecular and macromolecular materials (both in solid and liquid phase). Develop innovative and interdisciplinary applications. Role: <u>participant</u> |
| From: 2012 To: 2015 | COST ACTION MP1101 Bio-Plasma , european networking project. Topic: Intensify the knowledge base relevant to medical and biomedical applications of atmospheric pressure plasma technology. Role: <u>participant</u> |
| From: 2009 To: 2012 | SIMBA , european 7th Framework Program grant. Topic: Optimization and scale-up to the industrial level of RF plasma systems for nanoparticle synthesis through modeling, diagnostics and experiments. Role: <u>participant</u> |

PUBLICATION SUMMARY

- 85 papers, 24 h-index, 1608 citations (source Scopus).

AFFILIATIONS

- Member of the International Plasma Chemistry Society (2011 – to date)
- Member of the International Society of Plasma Medicine (2012 – to date)
- Member of the Interdepartmental Center for Industrial Research: CIRI - Advanced Applications in Mechanical Engineering and Materials Technology at Alma Mater Studiorum – Università di Bologna (2015 – to date)
- Member of the Interdepartmental Center for Industrial Research: CIRI - Agrifood at Alma Mater Studiorum – Università di Bologna (2021 – to date)

HONORS, AWARDS AND INVITATIONS FOR SEMINARS/CONFERENCES

- 2018 - Early Career Plasma Medicine Award (ECPMA) from the International Society on Plasma Medicine (ISPM)
- 2014 - Early Career Presentation Award (ECPA) at the 5th International Conference on Plasma Medicine (ICPM5)
- 15 Plenary/keynote/invited lectures at international conferences and at international training schools
 - 2022, 12th International Symposium on Plasma Bioscience (ISPB12); invited lecture
 - 2022, Gaseous Electronic Conference (2022 GEC); invited lecture
 - 2022, 9th International Conference on Plasma Medicine (ICPM9) summer school; invited lecture
 - 2022, European Materials Research Society Spring meeting (2022 eMRS Spring Meeting); invited lecture
 - 2021, 30th International Toki conference on plasma and fusion research (ITC30); invited lecture
 - 2021, International conference on plasma medicine 8 (ICPM8); invited lecture
 - 2018, 2nd International workshop on plasma agriculture (IWOPA-2); invited lecture
 - 2018, 10th International symposium on advanced plasma science and its applications for nitrides and nanomaterials (ISPlasma2018); invited lecture
 - 2017, Nanocontact conference – Potential application of plasma and nanomaterials; invited lecture
 - 2017, 17th Conference on plasma physics and applications; invited lecture
 - 2016, International conference on plasma medicine 6 (ICPM6); plenary lecture
 - 2016, Training school on advanced diagnostics of discharges with liquids and plasma treated liquid phase; invited lecture
 - 2016, MRS Spring symposium on surfaces and interfaces for biomedical applications; invited lecture
 - 2016, EMN biomaterials meeting; invited lecture
 - 2016, Workshop on application of advanced plasma technologies in CE agriculture; invited lecture

INDICATORS OF ESTEEM/EDITORIAL ACTIVITIES

- Member of the International Advisory Board of Plasma Processes and Polymers (Wiley)
- Review Editor in Frontiers in Physics - Plasma Physics
- Member of the Editorial Board of Dental Materials (Frontiers)
- Member of the Editorial Board of Applied Sciences (MDPI)
- Editor of the Plasma Chemistry and Plasma Processing special issue on the 24th International Symposium on Plasma Chemistry; published in 2020
- Editor of the Applied Sciences special issue *Cold Plasma Treatment for Food Safety and Quality*; published in 2019
- Editor of the Plasma Processes and Polymers special issue *Plasma and agriculture*; published in 2018
- Editor of the Plasma Medicine special issue *Bioplasmas and Plasmas with Liquids* dedicated the Joint Conference of COST ACTIONS CMST TD1208 'Electrical Discharges in Liquids for Future Applications' & MPNS MP1101 'Biomedical Applications of Atmospheric Pressure Plasma Technology'; published in 2016
- Editor of the Journal of Physics Conference Series special issue dedicated to the 12th European Plasma Conference - High-Tech Plasma Processes; published in 2012
- Referee for the journals: *Plasma Processes and Polymers*, *Journal of Applied Physics*, *Biomatter*, *Journal of Nanoparticle Research*, *Biointerphases*, *Plasma Medicine*, *Acta Biomaterialia*, *Scientific Reports*, *The European Physical Journal - Applied Physics*, *Plasma Sources Science and Technology*, *Journal of Biophotonics*, *Journal of Physics D: Applied Physics*, *Biomaterials*, *Materials and Design*, *Innovative Food Science and Emerging Technologies*, *Applied Physics Letters*, *IEEE Transactions on Plasma Science*, *JVST-B*, *Polymers*, *Surfaces and Interfaces*, *Reviews of Modern Plasma Physics*. Evaluator of book proposals for *Wiley*, *Springer*.
- Awarded the IOP Trusted Reviewer status
- Evaluator for international foundations grants: Belgium (The Research Foundation – Flanders, FWO), The Netherlands (Netherlands Organisation for Scientific Research, NWO), France (Institut National de la Santé et de la Recherche médicale - INSERM), Cyprus (Cyprus Research Promotion Foundation), Estonia (Estonian Research Council), Czech Republic (Czech Science Foundation), Canada (Fonds de recherche Nature et technologies Québec)
- External referee for the doctoral thesis of the Program in Materials Science and Engineering of the Universitat Politècnica de Catalunya

TEACHING AND MENTORING EXPERIENCE

Summary

- Teaching: plasma science and applications, numerical analysis (bachelor/master/advanced studies level)
- Tutoring: computer science fundamentals (bachelor level, 4 years)
- Mentoring: co-supervisor of 11 PhD students (3 completed, 4 ongoing); currently supervising 2 post-docs; supervisor of 12 MS thesis and 14 Bachelor thesis; co-supervisor of more than 50 MS/BS thesis

| Year | PhD |
|---------------|---|
| Expected 2026 | Andrea Marchetti, <i>Design oriented modelling of plasma assisted methane pyrolysis</i> ; PhD in Mechanics and Advanced Engineering Sciences, Università di Bologna. Role: principal supervisor |
| Expected 2026 | Mariachiara Grande, <i>Development and implementation of forecasting, model predictive control and image analysis tools in plasma and nuclear reactor physics</i> ; PhD in Mechanics and Advanced Engineering Sciences, Università di Bologna. Role: principal supervisor |
| Expected 2026 | Caterina Maccaferri, <i>Plasma assisted systems for packaging decontamination</i> ; PhD in Health and Technology, Università di Bologna. Role: assistant supervisor |
| Expected 2026 | Francesco Tomelleri, <i>Plasma assisted technologies to support innovative and sustainable sanitization processes in the agri-food sector</i> ; PhD in Mechanics and Advanced Engineering Sciences, Università di Bologna. Role: assistant supervisor |
| Expected 2025 | Roberto Montalbetti, <i>Development, optimization and engineering of non-equilibrium plasma sources at atmospheric pressure for the microbial inactivation of bioaerosols</i> ; PhD in Mechanics and Advanced Engineering Sciences, Università di Bologna. Role: assistant supervisor |
| Expected 2025 | Pasquale Isabelli, <i>Design, development and functional characterization of Cold Plasma Systems to reduce airborne transmission of Hospital Acquired Infections & COVID-19</i> ; PhD in Health and Technology, Università di Bologna. Role: assistant supervisor |
| Expected 2023 | Cristiana Bucci, <i>Exploitation of PALS (Plasma Activated Liquids) for antineoplastic pro-drugs activation through exogenous reactive oxygen and nitrogen species</i> ; PhD in Health and Technology, Università di Bologna. Role: assistant supervisor |
| Expected 2023 | Giulia Laghi, <i>Functional characterization of plasma sources for material processing and biomedical applications</i> ; PhD in Mechanics and Advanced Engineering Sciences, Università di Bologna. Role: principal supervisor |
| 2021 | Alina Bisag, <i>Development and optimization of techniques and design parameters for the engineering of atmospheric pressure plasma devices</i> ; PhD in Mechanics and Advanced Engineering Sciences, Università di Bologna. Role: assistant supervisor |
| 2020 | Federica Barletta, <i>Deposition of thin films by a non-equilibrium atmospheric pressure Plasma Jet: a poly-diagnostic study</i> ; PhD in Mechanics and Advanced Engineering Sciences, Università di Bologna. Role: principal supervisor |
| 2020 | Tommaso Galligani, <i>Non-equilibrium atmospheric plasma as a novel route to nanomaterial synthesis and processing for biomedical applications</i> ; PhD in Mechanics and Advanced Engineering Sciences, Università di Bologna. Role: assistant supervisor |

INSTITUTIONAL AND ORGANIZATIONAL ACTIVITIES

| Years | Academic duty |
|-------------------------|---|
| From 2022 To: active | Director of Second Cycle Degree in Energy Engineering, Università di Bologna |
| From 2022 To: active | Member of the Executive Committee of the Interdepartmental Center for Industrial Research: CIRI - Advanced Applications in Mechanical Engineering and Materials Technology, Università di Bologna |
| From 2021 To: active | Member of the Scientific Board of the Collegio Superiore (Institute for Higher Studies), Università di Bologna |
| From 2021 To: 2022 | Member of the committee of the State Exams for the qualification to the engineering profession, Università di Bologna |
| From 2021 To: 2021 | Member of the final examination committee for the ITS Maker Foundation |
| From 2021 To: active | Member of the High Quality Committee of the Master and Bachelor courses of Energy Engineering, Università di Bologna |
| From 2019 To: active | Responsible for the PhD education and training program of the PhD school in Mechanics and Advanced Engineering Sciences (DIMSAI), Università di Bologna |
| From 2019 To: active | Responsible for student exchange programs for the Master and Bachelor courses of Energy Engineering, Università di Bologna |
| From 2018 To: active | Member of the Executive Committee of the PhD school in Mechanics and Advanced Engineering Sciences (DIMSAI), Università di Bologna |
| From 2018 To: active | Member of work group for the implementation of the strategic development plan of the Department of Industrial Engineering, Università di Bologna |
| From 2018 To: 2021 | Member of the Executive Committee of the Department of Industrial Engineering, Università di Bologna |

| Years | Conference/Society and covered role |
|--------------|---|
| 2023-2028 | Member of the Board of Directors of the International Society for Plasma Medicine |
| 2023 | International Symposium on Plasma Chemistry (ISPC25); role: member of the Local Organizing Committee |
| 2022 | 9 th International Conference on Plasma Medicine; role: member of the Local Organizing Committee |
| 2021 | 1 st Workshop on plasma applications for smart and sustainable agriculture; role: member of the International Scientific Committee |
| 2019 | International Symposium on Plasma Chemistry (ISPC24); role: co-chair |
| 2019 | ISPlasma2019/IC-PLANTS2019; role: program committee member |
| 2016 | 14 th European Plasma Conference - High-Tech Plasma Processes (HTPP14); role: member of the International Scientific Committee |
| 2016 | Gordon Research Seminar on Plasma Processing Science; role: co-chair |
| 2015 | Bioplasmas and Plasmas with Liquids – Joint conference of COST actions CMST TD1208 and MPNS MP1101; role: secretary |
| 2012 | 12 th European Plasma Conference - High-Tech Plasma Processes (HTPP12); role: member of the Local Organizing Committee and of the Scientific secretariat |

Bologna, 3/2/2023



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