

# DAVIDE CADEMARTORI

## DESCRIPTION OF PHD ACTIVITIES

I have just completed my PhD at the University of Genoa. I worked at the fabrication and electrochemical characterization of innovative **Solid Oxide Cells (SOCs)** produced by the freeze tape casting and infiltration methods. The development of electrochemical and microstructural models for graded porous electrodes was carried out in collaboration with the CEA centre of Grenoble between January and August 2023.

Based on my research activities, the project **H<sub>2</sub>ELM** (fabrication of innovative SOC<sub>s</sub> for marine propulsion) was developed for the creation of a **spin-off**. In June 2021, it was awarded from the Nowtilus initiative, among a pool of 70, for the creation of a spin-off in the Ligurian marine environment.

[Nowtilus presentation](#)

## ACQUIRED SKILLS

- Electrochemical and microstructural modelling of SOC<sub>s</sub> by the software Matlab and Comsol
- Electrochemical Impedance Spectroscopy techniques
- SOC<sub>s</sub> fabrication by tape casting, freeze tape casting, infiltration, vapor spray deposition

## LANGUAGE SKILLS

- Italian: Native
- English: C1 level
- French: B1 level

## SOFTWARE SKILLS

- Office, Matlab, Comsol, Python, Zview, Origin: Intermediate/Advanced
- SimaPro, AspenPlus, Fluent, Simulink, Codeblocks: Basic

## EXTRAS

- Full clean driving license

## REFERENCES

PhD Supervisor: M. Paola Carpanese

## EDUCATION

### PhD Course in Chemical, Materials and Process Engineering DICCA, University of Genoa (Italy)

November 2020 – February 2024

Final grade: **Excellent CUM LAUDE**

### Master's Degree in Chemical and Process Engineering Polytechnic School, University of Genoa (Italy)

September 2017 – March 2020

Final grade: **110/110 CUM LAUDE**

**Focus on:** chemical plants, multiscale analysis and simulation of chemical processes, chemical reactors and applied kinetics, electrochemical materials and technologies, refinery and petrochemistry, industrial biotechnologies, ceramic materials, local transport phenomena.

**Thesis title:** "*Fabrication and electrochemical testing of button solid oxide cells*". Supervisors: Prof. Robert Steinberger-Wilckens, Prof. Maria Paola Carpanese, Dr. Ahmad El-Kharouf. Universities of Genoa and Birmingham.

### Bachelor's Degree in Chemical Engineering Polytechnic School, University of Genoa (Italy)

September 2014 – July 2017

Final grade: **110/110 CUM LAUDE**

**Focus on:** chemical processes and plants, thermodynamics, electrochemistry, fluid mechanic, corrosion and protection of materials, transport phenomena, materials science, general metallurgy.

**Thesis title:** "*Electrochemical and structural characterisation of a composite electrolyte based on doped ceria (GDC) and LSGM for fuel cells at intermediate temperatures*". Supervisors: Prof. Maria Paola Carpanese, Prof. Rodolfo Botter. University of Genoa.

### Classical High School Diploma Liceo Classico Federico Delpino, Chiavari (Italy)

September 2009 – June 2014

Final Grade: **100/100**

## ABROAD EXPERIENCES AND COLLABORATIONS

### PhD Collaboration: Commissariat à l'Energie Atomique (CEA), Grenoble (Fr)

January 2023 - August 2023

Construction of a tailored electrochemical model for graded porous electrodes. Electrochemical testing of innovative fuel electrodes for Solid Oxide Cells.

### PhD Collaboration: ISTEK CNR, Faenza (It)

November 2021– December 2021 and May 2022 – June 2022

Manufacturing of graded porous electrodes for Solid Oxide Cells by the freeze tape casting technique.

## Master's thesis with Erasmus+ for Traineeship: Centre for Hydrogen and Fuel Cell Research

University of Birmingham (UK)

September 2019 – February 2020

Experimental activity on manufacturing and electrochemical analysis of reversible button solid oxide cells. Team and independent work.

## RESEARCH SCHOLARSHIPS

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I have been the recipient of two research scholarships issued by the department of Civil, Chemical and Environmental Engineering (DICCA) of the University of Genoa:

- **“Contributo alla fabbricazione e caratterizzazione elettrochimica di un microstack a ossidi solidi a struttura innovativa per elettrolisi da acqua di mare”**, December 2023 – February 2024  
Supervisor: Prof. Maria Paola Carpanese
- **“Fabrication and electrochemical characterisation of solid oxide co-electrolysis cell components”**, September 2020 – October 2020  
Supervisor: Prof. Maria Paola Carpanese
- **“Preliminary investigations on perovskite electrodes as candidates for the development of the COELUS project”**, June 2020 – July 2020  
Supervisor: Prof. Maria Paola Carpanese

## SCHOLARSHIP AWARDS AND OTHER ACTIVITIES

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- Scholarship **“Galileo Galilei – Young Researcher”** from Rotary International Club, 2022.
- **NOWTILUS – SEA INNOVATION HUB**: business training from the incubator Wylab for the spin-off H<sub>2</sub>ELM after contest and selection from Nowtilus stakeholders. Presentation of business plan to the investors. May-Dec 2021.
- Scholarship **“Roberta Miglio”** from INSTM, 2021.
- Five scholarships from **“Fondazione Arvedi Buschini”**, 2015 – 2019.

## CERTIFICATES

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- Professional qualification certificate, Industrial Engineer, 2020.
- Certificate of attendance to “GHG Junior Manager Course”, 2019.
- First certificate in English, Level B2, Cambridge Assessment English, 2018.

## TEACHING AND TUTORSHIP

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Teaching assistance for the course of “Ceramic Materials”, University of Genoa, academic year 2023-2024, 5 hours.

Teaching assistance for the course of “Chemistry”, University of Genoa, academic year 2021-2022, 6 hours.

Co-supervisor of one Master's thesis for the SERP+ project, University of Genoa, 2023.

Co-supervisor of two Bachelor's theses at the DICCA department of the University of Genoa, 2023.

## PUBLICATIONS IN JOURNALS WITH IMPACT FACTOR

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**“The design optimization of nanostructured hierarchical electrodes for solid oxide cells by artificial impregnation”**. *Materials & Design*, IF 8.4, 2024.  Davide Cademartori, Maxime Hubert, Peter Cloetens, M. Paola Carpanese, Jérôme Laurencin.

**"Microstructural and electrochemical properties of Ni-impregnated GDC10 and 8YSZ freeze tape cast scaffolds as fuel electrodes for solid oxide cells"**. *International Journal of Hydrogen Energy*, IF 7.139, 2023. [Davide Cademartori](#), Davide Clematis, M. Paola Carpanese.

**"A High-Performance Co-Free Electrode for Solid Oxide Cells:  $\text{La}_{0.7}\text{Sr}_{0.3}\text{Cu}_{0.15}\text{Fe}_{0.85}\text{O}_{3-\delta}$  Synthesis and Characterisation"**. *Journal of Alloys and Compounds*, IF 6.31, 2023. [Davide Cademartori](#), Antonio Maria Asensio, Davide Clematis, Juan Felipe Basbus, Massimo Viviani, Sabrina Presto, Antonio Barbucci, M. Paola Carpanese.

**"Fabrication and Electrochemical Modelling of 8YSZ and GDC10 Freeze Tape Cast Scaffolds for Solid Oxide Cells (SOCs)"**. *Journal of the European Ceramic Society*, IF 6.364, 2023. [Davide Cademartori](#), Elisa Mercadelli, Angela Gondolini, Antonio Maria Asensio, Antonio Bertei, Alessandra Sanson, M. Paola Carpanese

**"Calcium doping in double perovskite  $\text{SmBa}_{1-x}\text{Ca}_x\text{Co}_2\text{O}_{5+\delta}$  to enhance the electrochemical activity of solid oxide cell reversible oxygen electrode"**. *Journal of Alloys and Compounds*, IF 6.31, 2023. Antonio Maria Asensio, Davide Clematis, [Davide Cademartori](#), Maria Paola Carpanese, Massimo Viviani, Cristina Carbone, Antonio Barbucci.

**"Solid oxide fuel cells for shipping: A machine learning model for early detection of hazardous system deviations"**. *Process Safety and Environmental Protection*, IF 7.51, 2023. Tomaso Vairo, [Davide Cademartori](#), Davide Clematis, Maria Paola Carpanese, Bruno Fabiano.

**"Fuel cells for shipping. An Approach towards Dynamic Safety Assessment"**. *Chemical Engineering Transactions (AIDIC)*. IF 0.7, 2022. Tomaso Vairo, [Davide Cademartori](#), Maria P. Carpanese, Davide Clematis, Antonio Barbucci, Bruno Fabiano.

**"Impregnation of microporous SDC scaffold as stable solid oxide cell BSCF-based air electrode"**. *Energy*. IF 7.147, 2021. Antonio Maria Asensio, Davide Clematis, Massimo Viviani, M. Paola Carpanese, Sabrina Presto, [Davide Cademartori](#), Pere L. Cabot, Antonio Barbucci.

**"Infiltrated  $\text{Ba}_{0.5}\text{Sr}_{0.5}\text{Co}_{0.8}\text{Fe}_{0.2}\text{O}_{3-\delta}$ -based electrodes as anodes in solid oxide electrolysis cells"**. *Energies (MDPI)*. IF 2.707, 2020. X. M. d'Intignano, [D. Cademartori](#), D. Clematis, S. Presto, M. Viviani, R. Botter, A. Barbucci, G. Cerisola, G. Caboche and M. P. Carpanese.

## SCIENTIFIC CONFERENCES WITH DELIVERED PRESENTATIONS

[Davide Cademartori](#), Maxime Hubert, Elise Bonnet, Jean-Marc Bassat, M. Paola Carpanese, Jérôme Laurencin – Euromech Colloquium 632, September 2023, oral presentation.

**"Microstructural Modeling of Infiltrated Electrodes for Solid Oxide Cells (SOCs)"**.

[Davide Cademartori](#), Maxime Hubert, Jerome Laurencin, Maria Paola Carpanese – XVIII Ecers congress, 2-6 July 2023, oral presentation.

**"Microstructural and electrochemical characterization of freeze tape cast fuel electrodes for solid oxide cells (SOCs)"**.

[Davide Cademartori](#), Davide Clematis, Antonio Maria Asensio, Antonio Bertei, Massimo Viviani, Sabrina Presto, Antonio Barbucci, M. Paola Carpanese – 8th Regional Symposium on Electrochemistry of South-East Europe, 11-15 July 2022, keynote.

**"The Freeze Tape Casting Technique for the Manufacturing of Graded Porous Scaffolds for Solid Oxide Cells: Experimental Activities and CFD Modelling"**.

Davide Cademartori, Davide Clematis, Antonio Barbucci, Antonio Maria Asensio, Massimo Viviani, Sabrina Presto, M. Paola Carpanese - 12<sup>th</sup> International Symposium on Electrochemical Impedance Analysis, Germany, 29-30 November 2021, oral presentation.

**“Impedance analysis of copper-based perovskite electrodes for reversible solid oxide cells”**

Davide Cademartori, Alessandra Sanson, Elisa Mercadelli, Angela Gondolini, M. Paola Carpanese. – SCI2021 Online Congress, 14-23 September 2021, oral presentation.

**“Anode-supporting substrates with hierarchical porosity manufactured with freeze tape casting for reversible solid oxide cells”**

## SCIENTIFIC CONFERENCES WITH POSTER PRESENTATIONS

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Davide Cademartori, Maxime Hubert, Atharva Nilawar, Jerome Laurencin, M. Paola Carpanese – XXIII National Catalysis Congress, Genova, 14-16 June 2023.

**“Artificial Impregnation of a Freeze Tape Cast YSZ Scaffold for Solid Oxide Cells (SOCs): Electrode Design Optimization”**

Davide Cademartori, Davide Clematis, Antonio Maria Asensio, Elisa Mercadelli, Angela Gondolini, Alessandra Sanson, Antonio Bertei, Massimo Viviani, Sabrina Presto, Antonio Barbucci, M. Paola Carpanese – 32nd Topical Meeting ISE, 19-22 June 2022.

**“Freeze Tape Casting for Solid Oxide Cells: Manufacturing and CFD Simulation of Graded Porous Electrodes”**

Davide Cademartori, Elisa Mercadelli, Angela Gondolini, Alessandra Sanson, Ahmad El-Kharouf, Robert Steinberger-Wilckens, Davide Clematis, Antonio Maria Asensio, Maria Paola Carpanese – 15<sup>th</sup> EFCF, 5-8 July 2022.

**“Fabrication and CFD modelling of a graded porous scaffold for Reversible Solid Oxide Cells (rSOCs)”**

Davide Cademartori, Davide Clematis, Antonio Barbucci, Antonio Maria Asensio, Massimo Viviani, Sabrina Presto, M. Paola Carpanese. – EIA 2021 online congress, 29-30 November 2021.

**“Impedance analysis of copper-based perovskite electrodes for reversible solid oxide cells”**

## SCIENTIFIC CONFERENCES AS COAUTHOR

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A.M. Asensio, D. Clematis, D. Cademartori, M. Viviani, S. Presto, M.P. Carpanese, M. Delucchi, M. Panizza, A. Barbucci - 12<sup>th</sup> International Symposium on Electrochemical Impedance Analysis, Germany, 29-30 November 2021.

**“Infiltration of microporous SDC backbone as stable solid oxide cell BSCF-based air electrode”**

M. Paola Carpanese, Davide Cademartori, Tiziano Freddi, Davide Clematis, Antonio Barbucci, Antonio Maria Asensio, Marco Panizza, Dario Montinaro - SCI2021 Online Congress, 14-23 September 2021.

**“Copper-based perovskite electrodes for reversible solid oxide cells”**

## MEMBERSHIPS

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*Italian Chemistry Society – SCI*

*International society of electrochemistry – ISE*