

PhD Program in Civil, Chemical and Environmental Engineering November 2023 Call, XXXIX cycle - Starting date: March 1st 2024

Curriculum in Chemical, Materials and Process Engineering

The research projects submitted for the admission to the PhD program must be prepared in accordance to one of the projects listed below. Click on the Thematic you are interested in to see the full list of projects.

Project: Molten Carbonate Fuel Cells applied to energy transition

Keywords: energy transition, molten carbonate fuel cells, gas to power, power to gas, experimentation and modelling

Brief Description:

In the current context of energy transition, molten carbonate fuel cells (MCFCs) are proposed as a strategic solution that allows the production of energy with high efficiency and the simultaneous capture of CO₂ from the exhaust of existing plants.

ENEA has over twenty years of experience in relation to this technology, developed within national and international scientific collaborations as well as in support and supported by the industrial activity of various companies. In particular, at ENEA there is a laboratory dedicated to the testing of molten carbonate fuel cells, also operating in reversible mode, therefore not only "Gas to Power" for the production of energy, but also "Power to Gas" for the production of hydrogen-rich syngas.

In this context, UNIGE, and specifically the Department of Civil, Chemical and Environmental Engineering, has developed an internationally recognized methodological approach for the multiscale analysis of MCFCs, from the study of the electrode microstructure to the process analysis of plants, based on the parallel proceeding of modeling and experimentation.

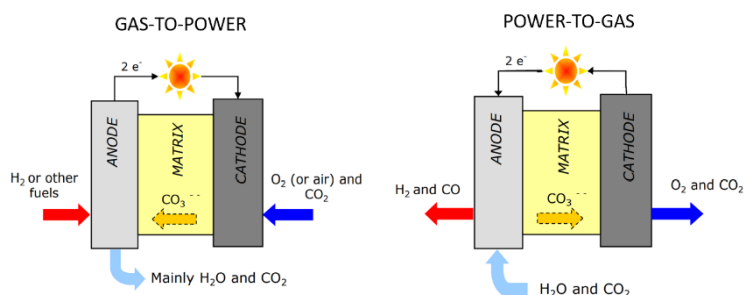
The proposed doctoral project would integrate into this scenario by offering the possibility of a joint research activity that aims to promote the development of MCFC technology in a perspective not only of scientific investigation, but also of industrial production.

The planned activity would include both modeling and experimentation at both sites. However, the main support of UNIGE in terms of theoretical analysis and of ENEA in terms of experimental investigation at its laboratories suggest that the PhD student will stay mainly at the headquarters of the ENEA Casaccia laboratories (Rome).

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Relevant links: <https://www.casaccia.enea.it/>, https://dicca.unige.it/laboratori/lab_congiunti

Figure:



Molten carbonate fuel cell operating modes

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