PhD Program in Civil, Chemical and Environmental Engineering
Curriculum in Chemical, Materials and Process Engineering

June 2025 Call, XLI cycle - Starting date: November 1 st 2025

The research projects submitted for the admission to the PhD program must be prepared in accordance with one of the projects listed in this file, which are organized by general thematics. Click on the Thematic you are interested in to see the full list of projects.

Projects in Plants and bioprocesses

Projects in reliability and safety of process plant engineering

Projects in materials engineering

Projects in sustainability of products

Chemical processes with reduced environmental impact

Others Projects

Ph.D. Program in Civil, Chemical and Environmental Engineering
dottorato.dicca@unige.it
+39 010 3352303
Via Montallegro 1, 16145 Genova
Coordinator: roberta.massabo@.unige.it

Projects in Plants and bioprocesses

Project: Treatment of agro-industrial wastewaters using microalgae

Project: Anaerobic digestion of agro-industrial residues with a view to a zero-waste approach

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dottorato.dicca@unige.it
+39 010 3352303
Via Montallegro 1, 16145 Genova
Coordinator: roberta.massabo@.unige.it

Thematic: Projects in Plants and bioprocesses

Project: Treatment of agro-industrial wastewaters using microalgae

Keywords: emerging pollutants, microplastics, new plant development, microalgal biomass exploitation.

Brief Description:
The increasing of urbanization and industrialization leads to the production of large quantities of wastewater around the world. Part of this waste can be treated and exploited for the growth of microalgae, reducing their cultivation costs, and making chemicals recovery and biofuel production more feasible.
Using the mixotrophic metabolism, microalgae are able to absorb and use many of the organic molecules contained in wastewater (antibiotics, heavy metals, microplastics, etc.), reducing its polluting load, leading to the production of additional microalgal biomass and to the purification of the water used.
After the growth, the microalgae biomass can be collected and used for the production of biofuels and for the recovery of chemicals of interest.
Batch and continuous microalgal growth systems are available in the laboratory of the research group. By means of these plants, wastewater (e.g.: olive mill and winery wastewaters, landfill leachate, sewage wastewaters, etc.) will be micro-phytotrophically treated and then analysed.
An ad hoc plant for the growth and the collection of microalgae in wastewaters will be studied and tested, reaching the goal to work in a full continuous mode. A pumping system, operating with variable flow rates, will be carefully developed to make the device less energy intensive and to reduce the hydraulic retention time. Downstream of the cultivation system, a plant will be designed for microalgal biomass settling, and the microalgal biomass will be collected using new methodologies, such as electro-coagulation.

Referent: Alessandro Alberto Casazza, alessandro.casazza@unige.it

Link to the list of projects

***Thematic*: Projects in Plants and bioprocesses**

Project: Anaerobic digestion of agro-industrial residues with a view to a zero-waste approach

Keywords: Agro-industrial waste, zero-waste approach, anaerobic digestion, biogas, microalgae

Brief Description:
This project concerns the application of anaerobic digestion to recover energy from agro-industrial residues. Olive pomace from olive oil production will first be dried to stabilize it and later diluted in water and treated in a 7-liter bench-scale digestor equipped with an agitation and temperature control system. Two different research topics will concern biogas upgrading in biomethane and digestate reuse. In the first case, the produced biogas will be conveyed to a photobioreactor in which a microalga will be cultivated autotrophically using the biogas CO2 as the only carbon source. As a result, biogas will be converted to biomethane with percentage higher than 90%. The second approach will take advantage of the ability of microalgae to grow under mixotrophic conditions in the presence of organic carbon source such as the contaminants still present in the digestate. In this case, the digestate produced in the first step will be treated in the photobioreactor in fed-batch mode in order to significantly reduce its chemical oxygen demand demand (COD). It is aimed, with the combination of the two approaches, to transform an agro-industrial residue such as olive pomace (or other similar residues) exclusively in biomethane and microalgal biomass to be used as a biofuel and as a raw material for biodiesel production, respectively, thus pursuing the zero-waste goal.

Referent: Alessandro Alberto Casazza, alessandro.casazza@unige.it

Link to the list of projects

Projects in reliability and safety of process plant engineering

Project: Data-driven NaTech Risk Assessment under Climate Change and Energy Transition

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Via Montallegro 1, 16145 Genova
Coordinator: roberta.massabo@.unige.it

Thematic: Projects in reliability and safety of process plant engineering

Project: Data-driven NaTech Risk Assessment under Climate Change and Energy Transition

Keywords: Natural disasters, NaTech risk assessment, data driven predictive models, Climate change, Major accidents.

Brief Description:
Background and Motivation
Natural Hazard Triggering Technological Disasters (NaTech) represent a growing threat due to the increasing frequency and severity of extreme weather events driven by climate change. These cascading events, such as floods triggering chemical leaks, or wildfires impacting energy infrastructure, pose complex and dynamic challenges to risk assessment frameworks that were not designed for evolving hazard landscapes. Traditional risk models often rely on static historical data, limiting their effectiveness in anticipating and managing real-time NaTech scenarios rapidly changing environmental conditions.
Research Aim
The PhD project aims to develop a novel framework for dynamic NaTech risk assessment that integrates real-time environmental monitoring with advanced Machine Learning (ML) algorithms. The goal is to enhance the predictive capability and responsiveness of current risk assessment systems by combining data-driven approaches with domain expertise in environmental and industrial safety.
Objectives
Overview: critical assessment of the state-of-the-art, bibliometric analysis and research gap selection.
Data Acquisition and Integration: Collect and harmonize multi-source real-time data, including satellite imagery, sensor networks, climate forecasts, and industrial safety reports.
Feature Extraction and Event Detection: Develop ML pipelines to detect early signals of NaTech risks from unstructured and high-frequency data streams.
Dynamic Risk Modeling: Design and validate ML-driven models (e.g., LSTM networks, spatiotemporal Bayesian models) to continuously update NaTech risk profiles in response to environmental modification.
Prototype Development: Build a real-time decision support tool for emergency managers and industrial operators, incorporating explainable AI techniques for transparency and trust.
Expected Contributions
The research will contribute to a shift from static to adaptive NaTech risk assessment methodologies. It will provide a robust, scalable, and explainable ML-based framework that improves situational awareness and response times. This work supports climate adaptation strategies by enabling proactive risk mitigation in critical infrastructure systems.
Supervision and Collaborations
The project will be developed in collaboration with regional environmental risk protection agencies, industrial safety bodies, and academic partners expert in machine learning and complex systems.

Referent: Bruno Fabiano, brown@unige.it

Relevant links: https://dicca.unige.it/laboratori/lab_chimica/sicurezza_industriale_ambientale

References:

Energy transition technology comes with new process safety challenges and risks Pasman, H., Sripaul, E., Khan, F. Fabiano, B. Process Safety and Environmental Protection, 2023, 177, pp. 765–794.

Methodology for probabilistic tsunami-triggered oil spill fire hazard assessment based on Natech cascading disaster modelling. Nishino, T. , Miyashita, T. , Mori, N. Reliability Engineering and System Safety, 242, 109789 2024.

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Projects in materials engineering

Project: CO2 valorisation via co-electrolysis with water to syngas

Project: Development of novel catalytic materials for conventional and unconventional heated reactors

Project: Advanced Porous Materials for Space Applications: Construction and Filters

Project: Engineering Drug Delivery Devices via Microfluidic Manufacturing Approaches

Project: Fabrication and characterization of eversible and symmetrical solid oxide cells (r-SOC) with innovative design

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Coordinator: roberta.massabo@.unige.it

Thematic: Materials Engineering

Project: CO2 valorisation via co-electrolysis with water to syngas

Keywords: Co-electrolysis, Solid Oxide Cells. CO2 valorization, Syngas, mixed ionic concductivity

Brief Description:
The main target of the project is to study reversible electrochemical systems for the valorization of CO2 rich streams via co-electrolysis of CO2 and water in syngas with the aim of solid oxide cells (SOC). Particularly the project focus materials with mixed ionic conductivity (anionic and protonic) able to work at intermediate temperature. The advantages of the proposed systems with respect to the state of the art one are:

- **Separation of water and CO2 in the two cell compartments**
- **Hydrogen production without water**
- **Selective pressurization of the two champers.**

Moreover, the system open new challenges thanks to the combination of co-electrolysis and reverse water gas shift reaction (RWGS) in the cathodic side of the cell.

This project focus in particular materials and understanding of the electrochemistry combining experimental and modelling activities.

Referents: Antonio Barbucci, barbucci@unige.it and Antonio Bertei, antonio.bertei@unipi.it

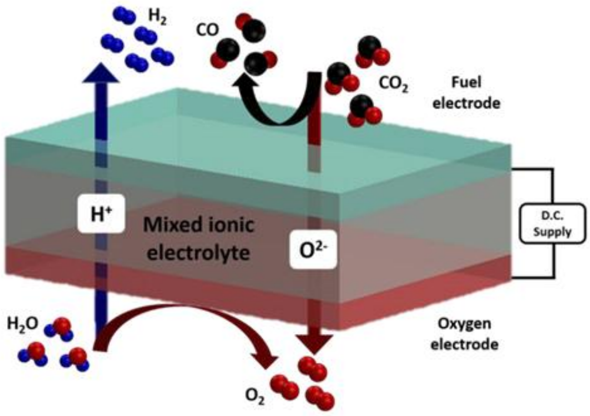

Figure: mechanism of co-ionic conduction in a Solid Oxide Cell

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Thematic: Materials engineering

Project: Development of novel catalytic materials for conventional and unconventional heated reactors

Keywords: catalysis, unconventional heating, reactor engineering

Brief Description:

The development of unconventional heated reactors sets new challenges in the framework of the introduction of new reactor designs in the chemical industry, outlining a completely new approach. The present project aimed at understanding the key parameters for the use of unconventional heating, studying and accounting for main process parameters, and investigating their performances in the frame of energy transition relevant reactions i.e., for H_2 production, or other relevant applications. The present project has an experimental nature and will focus on the development and design of engineered materials and processes, by focusing on performance assessment, mechanism, and kinetic investigations.

Referent: Prof. Gabriella Garbarino, gabriella.garbarino@unige.it

Link to the list of projects

Thematic: Projects in materials engineering

Project: Advanced Porous Materials for Space Applications: Construction and Filters

Keywords: porous materials, materials for space, lunar exploration, filters, photocatalytic materials

Brief Description:
The proposed scientific activity aims to produce advanced materials suitable for the utilization in a not so far lunar colonization and, hence, exploitable in the construction of extraterrestrial habitats. This renewed interest in lunar exploration will be develop by focusing the research on the manufacture of two different types of materials:

1) **porous materials as building elements from In Situ Resource Utilization (ISRU) regolith, via geopolymerization. The ISRU approach is fundamental to reduce the energy consumption associated with transport of the raw materials and to allow the creation of self-sustaining settlements, employing locally available raw materials. In particular, the main goal of this scientific activity will be the development of a production process based on additive manufacturing of structural units made of regolith-based geopolymers. The final materials needs to possess excellent stability and porosity, a lightweight structure and has to be optimized to guarantee the thermal insulation. Different production methods will be tested: mixing of liquid foams stabilized by foaming agents (essentially surfactants) with the cement mix; b) addition of the foaming agent directly into the cement mix and subsequent generation of the foam; c) addition to the cement mix of porogens, which produce gas through chemical reactions.**

2) **multiscale porous materials for efficient photocatalytic filtering in space habitats: development of innovative porous materials with tailored functionalities relevant in many applied fields, i.e. gas adsorption, filtering, air purification, catalysis. A method based on the consolidation of a green body obtained via gel-casting of particle stabilized foams will be applied to get efficient TiO_2 based photocatalytic porous materials, with open cell structure. The activity is addressed to reach some advances in the definition of procedures and formulation of the precursor foams, leading to the production of solid foams with open-cell structure, high specific surface area and good mechanical properties to be employed as photocatalytic filters.**

Referent: Alberto Lagazzo, alberto.lagazzo@unige.it and Eva Santini, eva.santini@cnr.it

Relevant links:

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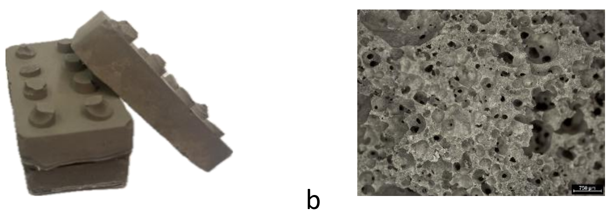

Figure: regolith based geopolymer (a) and micrography of its porous structure (b)

Link to the list of projects

Thematic: Materials engineering

Project: Engineering Drug Delivery Devices via Microfluidic Manufacturing Approaches

Keywords: microfluidics, emulsions, polymeric particles, liposomes, mathematical modelling

Brief Description:
Microfluidics is an emerging field that deals with the manipulation of fluids at the micrometric scale, offering high control over fluid behaviour, mixing, and interface formation. This innovative technique has numerous advantages with respect to conventional techniques, including precision in tuning droplet size, composition, and morphology, resulting in highly monodisperse populations. Moreover, microfluidic devices are highly versatile, as evidenced by the ability to customize microfluidic chips in terms of geometry and materials. Thanks to their versatility, precision and efficiency, microfluidic systems have become powerful tools for the synthesis of carrier systems, such as emulsions, liposomes, hydrogel beads, and polymeric nanoparticles. These carriers are of great interest in areas including targeted agriculture, food, cosmetic, biomedical, pharmaceutical, and environmental sectors, where particle size, monodispersity, and structural uniformity are critical parameters. This PhD project will focus on the design and fabrication of microfluidic chips capable of generating different kinds of carriers with high reproducibility and tunability and will combine experimental work with mathematical modelling to better understand and optimize the fluid dynamics and formation mechanisms involved.

Referent: Roberta Campardelli, roberta.campardelli@unige.it

Link to the list of projects

Thematic: Projects in materials engineering

Project: Fabrication and characterization of eversible and symmetrical solid oxide cells (r-SOC) with innovative design

Keywords: electrolysis, fuel cell, SOC, stability, reversibility

Brief Description:
The use of hydrogen as a fuel in the energy sector is technically possible and represents one of the most promising solutions for the decarbonisation of the field, especially in a long-term perspective. The advantages of this technology are many: zero local emissions (if the hydrogen is green), absence of vibrations and, as a crucial aspect, high efficiency.

The use of renewable energy sources (RES) is spreading very rapidly in many countries and there is a need to include devices in the electrical grid that compensate for the intermittency of RES. Solid oxide cells (SOCs) represent, in this context, an extremely effective technology: firstly, the high operating temperatures determine favourable thermodynamics and reaction kinetics, allowing unparalleled conversion efficiencies; secondly, the possibility of using inexpensive raw materials; third but not least, the potential synergies from the integration with downstream chemical syntheses, such as the production of methanol, synthetic fuels or ammonia is a convenient strategy from the point of view of logistics, energy density and environmental sustainability. However, SOC systems still suffer from critical issues related to degradation both during the fabrication phase and during operation: degradation is mainly due to the chemical and mechanical instability of the ceramic materials currently used and to the microstructural conformation of conventional electrodes. At the stack level, there are also issues related to the metal interconnections and gaskets typically used. In light of these considerations, the topic of this research consists in the fabrication and characterization of symmetric SOC cells with an engineered porous structure that improves the mechanical stability of the system. In a second stage, the realization of a micro-tack will be pursued. In addition to the morphology, the study will focus on the choice of readily available materials to be used both at the oxygen and the hydrogen side and inexpensive and easily scalable fabrication techniques.

Referent: M. Paola Carpanese, carpanese@unige.it

Link to the list of projects

Projects in sustainability of products

[Project: Development of green chemistry technologies and processes for the valorization of waste or bio-derived resources]

[Project: Circular hydrogen production from waste]

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Thematic: Sustainability of products

Project: Development of green chemistry technologies and processes for the valorization of waste or bio-derived resources

Keywords: catalysis, reactor engineering, biomass conversion, high value-added products

Brief Description:

Industrial chemistry is seeking new catalysts for the development of "green" processes arising from renewables and by maximizing renewable resources. In this frame, the production of green and bio-hydrogen, chemical commodities or pseudo-commodities has attracted the attention of scientific research by also addressing important challenges from material and reactor points of view. Together with H_2, the production of aldehydes, dienes, solvents, and emulsifiers could be foreseen starting from renewables (biomass, bioethanol etc.) or through unconventional processes. This doctoral project involves the development of processes, technologies, and catalytic materials for the conversion of organic molecules to products of industrial interest with a focus on green industrial chemistry and energy transition. The present project has an experimental nature and will focus on the development and design of engineered materials and processes in the frame of green industrial chemistry by focusing on performance assessment, mechanism, and kinetic investigations.

Referent: Prof. Gabriella Garbarino, gabriella.garbarino@unige.it

Link to the list of projects

Thematic: Sustainability of products

Project: Circular hydrogen production from waste

Keywords: thermochemical processes, pilot plant, circular economy

Brief Description:
The decarbonization of the European and global energy systems requires the development of effective energy carriers that can complement electrification in specific high energy density applications. In this space, renewable hydrogen is attributed a crucial role, although the replacement of the current 120 million tonnes global annual demand requires a major effort in the development of a spectrum of technologies.

Gasification represents a pathway to hydrogen with great potential, as it can couple the production of a renewable vector with the conversion of large flows of waste, in a circular approach. In this project, we propose the design and demonstration of an integrated process for hydrogen production from textile waste and biomass through pyrolysis-gasification, where biochar as a by-product finds an application as an adsorbent in the purification of hydrogen itself.

In specific, we will upgrade and validate a 0.5 MWth spouted bed oxygen-steam gasifier fed with biomass and textile waste and optimize its operation for hydrogen production through an extensive experimental campaign based on detailed process modelling activities. Moreover, we will recover the biochar produced during gasification and treat it in a fixed bed reactor to activate it for use as an adsorbent in substitution to commercial activated carbon in a pressure swing adsorption unit. The adsorption unit's efficiency in separating hydrogen will be tested on an artificial syngas stream replicating the average gas composition obtained in the spouted bed to determine the hydrogen purity and recovery rates attainable in comparison with a commercial product. In addition, purified syngas with specific gas composition could also be converted into chemicals through synthesis catalytic reactions to produce methanol (ratio $H2/CO=2$), ammonia (gas-phase catalytic reaction) or Fischer-Tropsch liquids as naphtha, diesel and gasoline (ratio $H2/CO=0.6-2$), showing the high versatility of the system.

The project will demonstrate the efficiency and feasibility of a closed-cycle process where hydrogen can be generated from waste and renewable biomass, and its purification can be achieved with the use of a pre-treated by-product generated within the same process. The research efforts accomplished will contribute towards the development of circular hydrogen technologies on the Italian territory and towards enhancing the country's competitiveness in energy innovation through dissemination to fellow academic and research institutions as well as key industrial actors.

Referents: Elisabetta Arato, elisabetta.arato@unige.it and Cristina Moliner, cristina.moliner@unige.it

Link to the list of projects

Chemical processes with reduced environmental impact

Project: Molten carbonate fuel cells for the decarbonization of hard-to-abate industrial sectors

Project: CO2 to use: catalytic processes design and investigation

Project: Assessment of the Industrial Risk of a New Sustainable Process for Electrodes Production for AEM /ALK Electrolyzers and development of a system for safe automated operation at reduced exposure to chemicals

Project: Circular hydrogen production from waste

Project: From Lab to Industry: MCFC Materials, Processes, and Market Integration Strategies

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Thematic: Chemical processes with reduced environmental impact

Project: Molten carbonate fuel cells for the decarbonization of hard-to-abate industrial sectors

Keywords: Carbon capture, fuel cells, material engineering, process analysis, industrial scale-up

Brief Description:
In the current context of the energy transition and decarbonization efforts, the development and implementation of innovative clean technologies is both necessary and urgent, including in the maritime sector. Within this framework, molten carbonate fuel cells (MCFCs) emerge as a particularly promising solution due to their dual capability to generate clean energy while simultaneously capturing CO_2 from exhausts. This makes them an ideal candidate for effective application in the hard-to-abate industrial sectors.

This PhD project aims to advance the key components of MCFC technology, specifically the electrodes, the matrix, and the electrolyte, through a combination of theoretical investigation and experimental research conducted at the CapLab laboratory in collaboration with the industrial partner Ecospray.

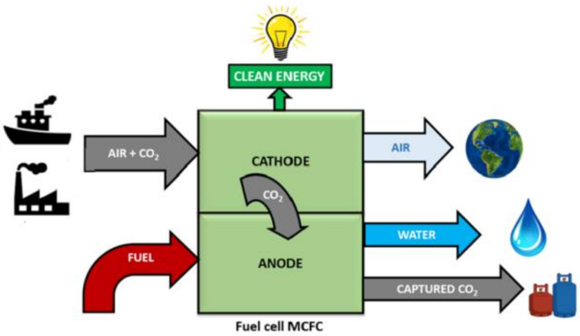
The primary objective is to optimize these components to achieve competitive performance levels, while ensuring that their production processes are environmentally sustainable, economically viable, and scalable for future industrial applications.

Specific chemical and morphological characteristics of the components must be achieved to ensure the required properties, such as electrical, ionic, and thermal conductivity, mechanical strength, and heterogeneous catalysis. This will involve investigating innovative fabrication recipes and processes beyond those currently found in the literature.

Additionally, the design and optimization of the cell layout and fuel cell stacks will also be studied to enable effective integration in existing plants typical of hard-to-abate sectors, such as steel manufacturing, chemical processing, and refining industries.

The project requires a multidisciplinary skill set, including materials science, chemical engineering, hands-on laboratory experience, and proficiency in modelling and simulation of the entire fuel cell system.

Referent: Barbara Bosio, barbara.bosio@unige.it



Link to the list of projects

***Thematic*: Chemical processes with reduced environmental impact**

Project: CO_2 to use: catalytic processes design and investigation

Keywords: CO_2, e-fuels, CO_2 utilization, chemical reaction engineering, catalysis

Brief Description:
CO_2 use is becoming one of the key challenges for the future and the development of new technologies and processes is pivotal for achieving sustainable development goals, set out by the United Nations, thus contributing to the carbon neutrality goal in the set target of 2050. The PhD project proposed here will be focused on catalysis and chemical reaction engineering in the development of new processes for this application by aiming at the reduction of environmental impact and by possibly outlining new technological solutions by looking at the process, reaction mechanism of chosen reactions, and kinetics to produce e-fuels and e-chemicals. Of utmost importance will be the coupling with renewable resources. An experimental point of view will address the present project.

Referent: Prof. Gabriella Garbarino, gabriella.garbarino@unige.it

Link to the list of projects

Thematic: Chemical Processes with reduced Environmental impact

Project: Assessment of the Industrial Risk of a New Sustainable Process for Electrodes Production for AEM /ALK Electrolyzers and development of a system for safe automated operation at reduced exposure to chemicals

Keywords: Industrial Risk, Electrodes, AEM Electrolyzers, Automation of Chemical Processes, AI for early-warning and safe-operation,

Brief Description:
Anion Exchange Membrane Water Electrolysis (AEMWE) is a promising approach for sustainable hydrogen production. Realizing efficient, durable AEM electrolyzers requires ongoing materials innovation and components integration. Both the raw materials and the produced electrocatalysts, polymer membranes, and electrodes are subject to REACH Regulation (EC 1907/2006).

At ECPLab DICCA (Savona Campus) we are actually working on the development of new materials for AEMWE (Projects: NEMESI, funded by MASE – PNRR, with Ansaldo Green Tech; ARKEL, funded by Compagnia di San Paolo; Collab with Antares Electrolysis and IIT). Our activities have been dedicated to the development of a new sustainable and low risk process for the production of high performance electrodes (patent filed by Unige) without managing powders, and in order to highly reduce possible exposure to chemicals.

The PhD position is inside this context and will focus on:

1) Assessment of the Human Health Risk due to chemicals for the proposed production process: all the main chemicals, process units and steps will be considered. The procedure must be carried out at Tier 1, 2 (partially 3), using methodologies for carrying out HHRA under uncertainty (already adopted by the research group).

2) Production of the electrodes at the required quality, i-e. defined electrochemical / transport properties (giving them stability and duration, tests on single-cells to be carried out in ECPLab) and optimization of the operating conditions of the process on the basis of the results of HHRA and obtained product quality.

3) A system for data acquisition and control of the main process units already exist, developed in Labview. The student will evaluate one of these possible approaches for improving the automated process. a) update the existing system in order to be remotely managed, allowing also to safely shut-down equipment in case of faults and lack of power supply, and possibly restart the process; b) developing an AI tool for early-warning and safe operation, working in parallel with the existing system.

Referent: Ombretta Paladino, paladino@unige.it

Relevant links:
https://it.linkedin.com/company/ecplab-unige
https://dicca.unige.it/laboratori/lab_chimica/ing_processi_chimici

Link to the list of projects

Thematic: Chemical Processes with reduced Environmental impact

Project: Circular hydrogen production from waste

Keywords: thermochemical processes, pilot plant, circular economy

Brief Description:
The decarbonization of the European and global energy systems requires the development of effective energy carriers that can complement electrification in specific high energy density applications. In this space, renewable hydrogen is attributed a crucial role, although the replacement of the current 120 million tonnes global annual demand requires a major effort in the development of a spectrum of technologies.

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In specific, we will upgrade and validate a 0.5 MWth spouted bed oxygen-steam gasifier fed with biomass and textile waste and optimize its operation for hydrogen production through an extensive experimental campaign based on detailed process modelling activities. Moreover, we will recover the biochar produced during gasification and treat it in a fixed bed reactor to activate it for use as an adsorbent in substitution to commercial activated carbon in a pressure swing adsorption unit. The adsorption unit's efficiency in separating hydrogen will be tested on an artificial syngas stream replicating the average gas composition obtained in the spouted bed to determine the hydrogen purity and recovery rates attainable in comparison with a commercial product. In addition, purified syngas with specific gas composition could also be converted into chemicals through synthesis catalytic reactions to produce methanol (ratio $H_2/CO=2$), ammonia (gas-phase catalytic reaction) or Fischer-Tropsch liquids as naphtha, diesel and gasoline (ratio $H_2/CO=0.6\text{-}2$), showing the high versatility of the system.

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Referents: Elisabetta Arato, elisabetta.arato@unige.it and Cristina Moliner, cristina.moliner@unige.it

Link to the list of projects

Thematic: Chemical processes with reduced environmental impact

Project: From Lab to Industry: MCFC Materials, Processes, and Market Integration Strategies

Keywords: Carbon capture, fuel cells, material engineering, process innovation, technology deployment

Brief Description:
In light of the pressing global effort to reduce greenhouse gas emissions and accelerate the energy transition, the exploration and advancement of innovative carbon capture technologies have become increasingly crucial. Among the emerging solutions, molten carbonate fuel cells (MCFCs) stand out for their distinctive capability to both generate low-emission energy and capture CO_2 directly from exhaust gas streams in industrial processes.

This PhD project, carried out in collaboration with the company STAM, focuses on the study and development of MCFC-based technologies within this broader framework. The research will follow two parallel and complementary paths.

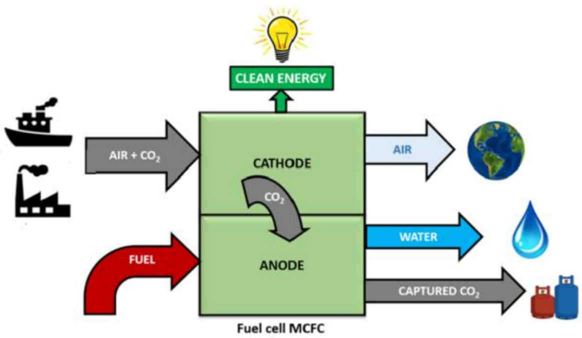
The main research line will be dedicated to the development of materials, components, and fabrication processes for the core parts of MCFCs, such as electrodes, matrix, and electrolyte, with the objective of producing innovative components that combine high performance with environmental sustainability and scalability. This experimental activity will be conducted at the CapLab joint laboratory.

In parallel, the project will pursue a strategic and managerial perspective, aimed at evaluating how these technologies can be effectively positioned within the current economic and industrial landscape. This will involve the analysis of potential routes for market introduction, strategies for intellectual property protection, integration opportunities with existing industrial systems, and identification of relevant stakeholders and end users.

By combining technological innovation with system-level analysis, the project aims to enable the effective deployment of MCFCs in the decarbonization of hard-to-abate sectors.

Referent: Barbara Bosio, barbara.bosio@unige.it

Figure:



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