Marina Micari, Ph.D.
SNSF Ambizione Group Leader

The research group led by Dr. Micari (Sustainable Process Modelling) works on the design and optimization of gas separation processes for sustainable industrial applications. The main research focus is on carbon capture processes for several applications, from direct air capture to concentrated point sources. We are particularly interested in understanding the impact of novel materials (membranes and sorbents) currently under development, when applied to large-scale separation processes. For this, we use advanced mathematical modelling tools and multi-objective optimization algorithms.

- Ph.D. position: ***Multi-objective Optimization of Carbon Capture Processes***

  This project focuses on the assessment and optimization of cost and environmental impact of carbon capture processes.
  The successful candidate will develop integrated models including techno-economic and life cycle analyses for multiple carbon capture technologies based on advanced materials (membranes and sorbents). We aim at producing Pareto fronts representing ***optimal trade-offs between cost and environmental impact*** outputs. This analysis will allow us to highlight advantages and critical hotspots for different capture applications and drive further research in materials development and process design.
  With her/his thesis, the Ph.D. student will introduce the novel concept of ***technology maps*** for carbon capture. These maps will show the optimal combination of technologies and materials for various capture applications, with different CO_2 concentration, feed flow rate, and required outlet purity.

- Ph.D. position: ***Optimization of Hybrid Processes for Direct Air Capture***

  This project focuses on the design and optimization of integrated capture processes for direct air capture (DAC).
  The successful candidate will work within the collaborative network of the SusEcoCCUS project, that will realize the ***first demonstration plants*** for carbon capture, utilization and storage (CCUS) operating in Switzerland.
  The Ph.D. student will design processes for DAC based on the novel ***combination of adsorption and membrane-based processes.*** We will select promising sorbents and membranes based on their technical, economic and environmental feasibility, and optimize operating conditions and process combinations.
  The final aim of the Ph.D. thesis is to produce the optimal process configuration that allows to ***significantly reduce energy, cost and environmental impact*** with respect to state-of-the-art technologies.

For both projects:
Students with a background in chemical engineering and with a strong interest in computational methods are encouraged to apply.
Please apply directly via email (marina.micari@epfl.ch). The application should include a brief statement of motivation, your CV and the full transcript of records.
The candidates have to be accepted by the EPFL doctoral school in Chemistry and Chemical Engineering. Next application deadline to the doctoral school: 15th of January 2025 (https://www.epfl.ch/education/phd/edch-chemistry-and-chemical-engineering/edch-how-to-apply/).
Start date: March 2025.