ALBERTO ARICI

PhD Researcher | CO_2 mass transfer • ionic liquids • multiphase systems

Milan, Italy alberto.arici@mail.polimi.it

PhD researcher in Energy Engineering at Politecnico di Milano, investigating CO_2 mass transfer in aqueous ionic-liquid systems from solvent properties and single-bubble dynamics to bubble-column scale-up. Experimental background in multiphase flow, thermophysical characterization and radiochemistry, combined with transport modelling and process simulation.

RESEARCH EXPERIENCE

SEP 2025 – PRESENT — **PhD Researcher in Energy Engineering (41st cycle)**

Department of Energy, Politecnico di Milano | AURIGA project

- Research topic: CO_2 absorption and gas–liquid mass transfer in aqueous ionic-liquid systems, supervised by Prof. Giorgio Besagni
- Characterization of [BMIM][BF_4]/water and [EMIM][OAc]/water mixtures: viscosity, density, dynamic surface tension, CO_2 solubility, bubble dynamics and liquid-side mass-transfer coefficient.
- Development of single-bubble and 1D bubble-column models linking thermodynamics, kinetics, hydrodynamics and scale-up parameters (kL, interfacial area and kLa).

NOV 2025 – APR 2026 — **Visiting PhD Researcher**

Institute of Multiphase Flows, Hamburg University of Technology (TUHH), Germany

- Six-month research stay and follow-up experimental visit in collaboration with Prof. Michael Schlüter and Dr. Felix Kexel.
- High-speed imaging and image analysis of Taylor bubbles in 6, 7 and 8 mm capillaries; determination of terminal rise velocity, bubble-volume shrinkage and CO_2 mass-transfer coefficients across ionic-liquid/water compositions.
- Thermophysical measurements at 20–30 °C using rotational rheometry, maximum-bubble-pressure tensiometry and density measurements.

JUN 2025 – SEP 2025 — **Research Fellow**

Department of Energy, Politecnico di Milano

Literature review on CO_2 mass transfer in ionic liquids and development of a methodology for solvent selection based on absorption capacity, transport properties and reactor performance.

EDUCATION

2021 – 2024 — **MSc in Nuclear Engineering — 110/110**

Politecnico di Milano | Nuclear Plants track

Thesis: “Advances in spent nuclear fuel recycling: new insight on sustainable hydrophilic ligands for selective americium separation.” Supervisor: Prof. Elena Macerata. Synthesis and characterization of CHON ligands and liquid–liquid extraction tests with actinide/lanthanide tracers within the PATRICIA/AmSel research framework.

2018 – 2021 — **BSc in Chemical Engineering — 92/110**

Politecnico di Milano

Thesis on the cross-metathesis of oleic acid using a Grubbs catalyst.

PUBLICATIONS AND MANUSCRIPTS

IN PREPARATION Arici, A.; Kexel, F.; Varallo, N.; Schlüter, M.; Besagni, G. “CO_2 Mass Transfer Dynamics at Taylor Bubbles in Ionic Liquid–Water Systems: Effect of Fluid Properties and Capillary Geometry.” Manuscript in preparation for Chemical Engineering Science.

IN PREPARATION Arici, A.; Besagni, G. “Ionic Liquids for CO_2 Capture: a Technological Review Focused on Bubble Columns.” Journal manuscript in preparation; archival conference paper accepted for SDEWES 2026.

CONFERENCE CONTRIBUTIONS

2026 Arici, A.; Besagni, G. “Ionic Liquids for CO_2 Capture: a Technological Review Focused on Bubble Columns.” SDEWES 2026, Gran Canaria, Spain, 30 Aug–4 Sep 2026. Archival paper and conference presentation.

2026 Arici, A.; Kexel, F.; Schlüter, M.; Besagni, G. “Detailed Investigation of CO_2 Mass Transfer in Ionic Liquid–Water Mixtures at Taylor Bubbles.” CHISA 2026, Prague, Czech Republic, 23–27 Aug 2026.

2026 Arici, A.; Besagni, G. “A Methodology for the Selection of Ionic Liquids for CO_2 Absorption Based on Thermodynamic and Kinetic Properties.” CHISA 2026, Prague, Czech Republic, 23–27 Aug 2026.

2026 Arici, A.; Kexel, F.; Thießen, F.; Schlüter, M.; Besagni, G. “Analysis of CO_2 Mass Transfer in Ionic Liquid–Water Mixtures by Thermophysical and Taylor Bubble Studies.” DECHEMA/VDI Working Party on Multiphase Flows, Dresden, Germany, 13–16 Mar 2026.

FORTHCOMING Arici, A.; Kexel, F.; Varallo, N.; Schlüter, M.; Besagni, G. “Thermophysical Characterization of Aqueous Ionic Liquid Mixtures for CO_2 Capture Applications.” AIPT Meeting 2026, Milan, Italy, 25 Sep 2026. Forthcoming oral presentation.

FORTHCOMING Varallo, N.; Arici, A.; Aissaoui, D.; Regert dos Santos, V. A.; Besagni, G. “Unveiling the Riddles of Gas–Liquid Fluid Dynamics: Towards Novel Carbon Dioxide Absorption Systems.” GLS-17, Goa, India, 12–15 Dec 2026. Forthcoming poster presentation.

STUDENT SUPERVISION

Tutoring/co-supervision of experimental and modelling thesis projects: one completed MSc thesis on single-bubble CO_2 absorption in ionic liquids; ongoing BSc/MSc work on CO_2 solubility, 1D bubble-column modelling and Aspen Plus process modelling.

TECHNICAL EXPERTISE

Mass transfer & multiphase systems: Bubble columns, Taylor bubbles, gas–liquid hydrodynamics, CO_2 absorption, ionic liquids, transport-property analysis, experimental design.

Experimental methods: High-speed imaging and image processing; rotational rheometry; dynamic surface tension; density and gas-flow measurements; liquid–liquid extraction; radioactive tracer handling in gloveboxes.

Chemical characterization: NMR, ESI-MS, HPLC, GC-MS, ICP-MS, XRD and alpha/gamma spectrometry.

Modelling & software: MATLAB, Python, ANSYS Fluent, Aspen HYSYS/Aspen Plus, Microsoft Excel and PowerPoint.

LANGUAGES

Italian — native | **English** — professional working proficiency (Cambridge FCE, B2) | **German** — elementary