

PhD in SCIENZE E TECNOLOGIE ENERGETICHE E NUCLEARI / ENERGY AND NUCLEAR SCIENCE AND TECHNOLOGY - 41st cycle

THEMATIC Research Field: CO2 ABSORPTION IN IONIC-LIQUID BUBBLE COLUMNS: COMBINING EXPERIMENTAL AND NUMERICAL TECHNIQUES

Monthly net income of PhDscholarship (max 36 months)		
1700.0		
In case of a change of the welfare rates during the three-year period, the amount could be modified.		
Context of the research activity		

Motivation and objectives of the research in this field	Bando a valere sul fondo FIS2 (Decreto Direttoriale n. 1236 del 1-8-2023), progetto AURIGA, Codice progetto FIS-2023-00204, CUP D53C25000730001 Bubble columns are gas-liquid reactors widely used in the chemical industry due to their ease of operation, minimal maintenance requirements and excellent heat and mass transfer between phases. For these reasons, bubble columns are one of the key technologies for carbon capture, allowing CO2 to be absorbed in solvents. Unlike traditional organic solvents, ionic liquids are low temperature melting salts, classified as 'green solvents', characterised by low volatility, high thermal stability, non- flammability and customizable physic-chemical properties. However, there is a significant gap in the understanding of the mass transfer dynamics between ionic liquids and bubbles in systems operating with CO2, highlighting the need for comprehensive research in this area. This research aims to bridge this gap. Objectives of the research are:
	 Develop advanced measurement techniques to measure the mass transfer rate. Carry out a systematic experimental investigation of

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	 two-phase bubble columns operating with ionic liquids and CO2 to characterize the mass transfer phenomena. Derive theoretical models and correlations for the prediction of the mass transfer coefficient for different ionic-liquids and column configurations. Disseminate the findings widely within the industrial and academic communities, thereby fostering the adoption of best practices and shaping the direction of future research.
	The expected tools to be used during the research are:
Methods and techniques that will be developed and used to carry out the research	Theoretical tools : Statistical analysis, Machine Learning,
	Computational tools: Matlab, Python, ANSYS Fluent,
Educational objectives	In general, this activity aims to promote interdisciplinary collaboration, develop critical thinking, and advance research skills. In particular, the PhD candidate will acquire high-level skills and expertise in the field of fluid dynamics research. The presence of international collaborations will allow the student to interact with leading European and non-European institutions in this research area.
Job opportunities	Job opportunities for a successful PhD candidate include both industrial and academical research or specific job positions as Thermal-Fluid Engineer and Chemical Engineer
Composition of the research group	2 Full Professors 4 Associated Professors 3 Assistant Professors 10 PhD Students
Name of the research directors	Giorgio Besagni

Contacts	
Prof. Giorgio Besagni - giorgio.besagni@polimi.it	

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Additional support - Financial aid per PhD student per year (gross amount)		
Housing - Foreign Students		
Housing - Out-of-town residents		

Scholarship Increase for a period abroad			
Amount monthly	850.0 €		
By number of months	6		

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Educational activities: Financial aid per PhD student is available for purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences, instrumentations and computer, etc. This amount is equal to 10% of the annual gross amount, for 3 years.

Teaching assistantship: Availability of funding in recognition of supporting teaching activities by the PhD student. There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

Computer availability: individual use.

Desk availability: individual use.