



PhD in CHIMICA INDUSTRIALE E INGEGNERIA

CHIMICA / INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING - 40th cycle

THEMATIC Research Field: THERMOCATALYTIC PROCESSES FOR CO₂ VALORIZATION TO E-FUELS AND E-CHEMICALS

Monthly net income of PhDscholarship (max 36 months)

€ 1400.0

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

The context of the proposed research activity is related to environmental protection and specifically to the reduction of CO₂ emission. In this respect, the request of renewable fuels and chemicals will significantly increase in the next years due to the need to go beyond conventional fossil sources to fight against climate change and to cope with legislation requirements that impose the reduction of CO₂ emissions. Among renewable fuels and chemicals, those obtained through catalytic CO₂ hydrogenation with green H₂ are of great interest. Presently there are no commercial processes for the production of e-fuels and e-chemicals. Objective of the proposed research is the development of new catalytic materials and processes for the production of these renewable and carbon-neutral molecules, either based on a single conversion step (one-pot processes) or on multi-step processes.

Methods and techniques that will be developed and used to carry out the research

The research activities will involve the synthesis of heterogeneous catalyst for the direct hydrogenation of CO₂ to hydrocarbons. The catalysts will be prepared by coprecipitation and/or impregnation techniques, or other advanced methods. The catalysts will be characterized by several characterization techniques to clarify the morphology and nature of active sites (e.g. N₂ adsorption/desorption, XRD, FTIR of adsorbed selected molecules, TPR), and tested in the CO_x hydrogenation



	under relevant conditions. This will allow to clarify the structure/activity relationships and the role of the active components, enabling the development of improved catalytic materials. Kinetic models capable of describing the conversion of the reactants and the formation of the reaction products will also be developed.
Educational objectives	To initiate the candidate to research activity, to develop skills in different fields including catalytic material preparation and characterization, and testing of catalysts; achievement of analytical methods for the analysis of gaseous and liquid products. To become familiar with team working.
Job opportunities	A PhD in this field will favor the placing in the R&D sector of energy and chemical companies, in a sector under great development in these years. Our recent PhD graduates in fact now operate in this sector, or in research centers abroad.
Composition of the research group	7 Full Professors 3 Associated Professors 5 Assistant Professors 15 PhD Students
Name of the research directors	Proff. L. Lietti, C.G. Visconti

Contacts	
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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

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

since this is a thematic scholarship, the management of Confidential Information, Results and their publication is subordinate to the restrictions agreed upon with the funding company. Upon acceptance of the scholarship, the beneficiary must sign a specific commitment.

Educational activities (funding for participation in courses, summer schools, workshops and conferences) - financial aid per PhD student per year:

- 1st year: around 1.900 euros per student
- 2nd year: around 1.900 euros per student
- 3rd year: around 1.900 euros per student

Teaching assistantship: availability of funding in recognition of supporting teaching activities by the PhD student:

There are various forms of financial of 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 regulation.