



PhD in CHIMICA INDUSTRIALE E INGEGNERIA

CHIMICA / INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING - 40th cycle

THEMATIC Research Field: STUDY OF STRUCTURED CONDUCTIVE INTERNALS FOR GREEN AMMONIA SYNTHESIS PROCESSES

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

Green ammonia is one the most promising H₂ carrier for the energy transition. Decentralized production and high energy cost of renewable H₂ urges the need of more compact and efficient reactor and processes technologies for ammonia synthesis. Such a technology is the ambitious goal of FASTER EU project. The target will be pursued through the development of novel catalysts, able to operate at milder conditions than the conventional ones, and novel synthesis reactors and adsorbers for ammonia separation, based on the adoption of conductive structured internals for improved thermal management of such process steps. Starting from its wide experience in the field the LCCP group of Politecnico di Milano is in charge of the design of novel conductive structured internals to be adopted in the project. Such internals will be manufactured and tested under process conditions by other partners in the Project. The objective of this research will be the identification of conductive structured internals, which can be realised by additive manufacturing techniques, able to maximise both reactor and adsorber performances by optimising the temperature control during process operations.

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

The candidate will develop mathematical models of the ammonia synthesis reactor and of the ammonia separation adsorber. The model will implement



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| | <p>engineering correlations for the evaluation of transport properties of solid beds with conductive structured internals as well as kinetic equations provided by other partners in the project. The models will be used to design optimized structures to be produced by additive manufacturing techniques by others partners in the project. Heat, mass and momentum transfer properties of the produced structured reactors will be measured by the candidate in dedicated rigs available at LCCP laboratories to preliminary validate the design activity. The obtained results will serve as an input for pilot scale units to be realized and operated by other partners in the project. Pilot scale data will be used for a final validation of the mathematical models previously developed.</p> |
| Educational objectives | <p>The candidate will gain high-level knowledge of experimental testing and modelling of advanced catalytic reactors and catalytic processes for the production of key energy vectors.</p> |
| Job opportunities | <p>The skills acquired by the candidate during the PhD programme will be useful for possible jobs in R&D roles of companies active in chemical processes design, catalyst manufacturers, EPC, oil and gas.</p> |
| Composition of the research group | <p>7 Full Professors 3 Associated Professors 10 Assistant Professors 20 PhD Students</p> |
| Name of the research directors | <p>Prof. Gianpiero Groppi</p> |

| Contacts |
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| <p>Telephone: 0223993258 Email: gianpiero.groppi@polimi.it Web-pages of the research group: https://www.lccp.polimi.it/;</p> |

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



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

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

Confidentiality:

Since this is a thematic scholarship, the management of Confidential Information, Results and their publication is subordinate to the restrictions settled in the consortium agreement of FASTER EU project.

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.