POLITECNICO DI MILANO

PhD in CHIMICA INDUSTRIALE E INGEGNERIA CHIMICA / INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING - 39th cycle

PNRR 117 Research Field: SYNTHESIS OF KEROSENE (E-JET FUEL) VIA CATALYTIC HYDROGENATION OF CO2

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 request of jet fuel will significantly increase in the next years due to the spreading of the aviation transport. This sector cannot be easily electrified and thus the decarbonization in this field is challenging. A possibility is the substitution of the traditional fossil fuels with carbon-neutral e-fuels (SAF, Sustainable Aviation Fuels) obtained e.g. through catalytic CO_2 hydrogenation with green H_2. This is a very challenging research objective in that presently there are no commercial processes for the production of e-jet fuels (e-kerosene). Objective of the proposed research is therefore the development of new catalytic processes for the production of e-kerosene through a series of catalytic reactions involving at first the CO_2 hydrogenation to light olefins, followed by the oligomerization of the produced olefins to jet fuels. The possibility of performing the process in a single stage (one pot process) will also be addressed.
Methods and techniques that will be developed and used to carry out the research	The research activities will involve the synthesis of Fe-based catalyst for the direct hydrogenation of CO_2 to light olefins, and the use of zeolites for the light olefins oligomerization. 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. N_2

	adsorption/desorption, XRD, FTIR of adsorbed selected molecules, TPR), and tested in the CO_2 hydrogenation and olefin oligomerization 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.
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. To become familiar with team working.https://www.dottorato.polimi.it/en/prospective-phd-candidateshttps://www.dottorato.polimi.it/fileadmin/user_upload/corsi/Chimica/Progetto_formativo_39___ciclo_-_Chimica_Industriale_e_Ingegneria_Chimica.pdf
Job opportunities	The PhD in this area will open the doors to companies acting in the field of process design and development, research, catalyst production and manufacturing.PhD graduates in Industrial Chemistry and Chemical Engineering are suitable candidates for positions in chemical process companies and research institutes, both private and public, operating in the fields of research, design, production, control, and consulting.
Composition of the research group	6 Full Professors 4 Associated Professors 5 Assistant Professors 15 PhD Students
Name of the research directors	Prof. C.G. Visconti, Profl L. Lietti

Contacts
www.energia.polimi.it

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

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	Eni SpA - Via Maritano 26, 20097 San Donato Milanese (MI) www.eni.com
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	to be defined
By number of months abroad	6

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