



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

**PNRR 118 PNRR Research Field: DEVELOPMENT OF INNOVATIVE SUSTAINABLE
POLYMERS**

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 development of functional and sustainable polymer is a key aspect that enable a technological transition from oil-based product to green materials. If from one side there is a huge pressure for an ecological transition, one the other side macromolecules cannot be replaced in many different fields. As a result, the development of innovative sustainable materials becomes a need that requires a careful design of them and of their production processes. In the production of Macromolecular materials, organic solvents must be replaced by water, fossil fuel raw materials by biobased ones, short life-time product must be degradable or compostable, energy-demanding material synthesis processes must be optimized in all of their production cycle. The research to be carried out in this doctorate will be focused in the development of sustainable polymeric dispersions adopting different polymerization techniques from the more conventional free radical polymerization to living reactions such as RAFT and PISA polymerization. Polymers will be developed for the synthesis of coating materials as well as bulky degradable and compostable polymers for packaging, biomedical and additive manufacturing applications.

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

The PhD formation will be based all on the application of the chemical engineering concepts starting from the



	<p>experimental validation of available literature processes for Macromolecular syntheses at the laboratory scale, to their optimization and test in different application fields. The PhD will work in particular in the selection of suitable biobased and biodegradable building blocks, determining their reactivity for implementing the best production process.</p>
Educational objectives	<p>To form a PhD able to drive the design from the literature (both scientific papers and patents) to the implementation of innovative processes for the production of sustainable polymers. For the PhD the project will be particularly challenging since she/he must take into account not only the selection of the best suitable raw-materials, but also in developing a suitable eco-friendly production processes. Lastly, she/he must also apply the developed materials in different key application fields such as coating, packaging and additive manufacturing.</p>
Job opportunities	<p>The background of the PhD at the end of her/his pathway will allow a number of possibilities in different companies, from the ones producing macromolecules, to those that apply these materials for the synthesis of many different goods. She/he will have in particular advantages in those positions for which the development and/or implementation of green initiatives is key</p>
Composition of the research group	<p>3 Full Professors 3 Associated Professors 2 Assistant Professors 15 PhD Students</p>
Name of the research directors	Prof. Moscatelli

Contacts

cfalab.chem.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	0

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	-
By number of months at the company	0
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
<p>Individual budget for research (5.700 euro): 1st year: 1.900 euro; 2nd year: 1.900 euro; 3rd year: 1.900 euro</p> <p>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.</p> <p>The main research activity will be developed at the CFA Lab where the PhD student will work in a fully equipped chemical laboratory.</p>