



# PhD in CHIMICA INDUSTRIALE E INGEGNERIA

## CHIMICA / INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING - 38th cycle

**PNRR\_352 Research Field: NOVEL SUSTAINABLE AND INNOVATIVE POLYMERS FOR THE PAPER INDUSTRY**

**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**

Numerous synthetic oil based polymers are nowadays used in the paper industry. The market is more and more looking at materials that are able to give the same performances to the final commercial products which are more sustainable. The transition from oil-based to sustainable-based materials is one of the key aspect of the so-called ecological transition. The research to be carried out in this doctorate will be the development of innovative polymeric materials to be used to substitute the oil based polyamides and the acrylic-based latexes used in the paper industry. The development of biobased and recyclable materials starting from itaconic acid and derivatives from bio-sources will be aimed. The implementation of these innovative materials will be carried out both at the laboratory scale and, through a scale up procedure, at the industrial one. Latter point will be carried out in collaboration with the host company, MARE Spa. The company will give the student the opportunity to work in their scale up laboratory where the student will be able to set up the material synthesis at a higher TRL. In addition the company, already involved in the cellulose-based market will provide a strong support in the ecological transition for the material LCA definition.

**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 the use of novel biobased/sustainable polymeric materials at the laboratory scale, to their optimization. The PhD student will also work at the implementation of the optimized materials at the industrial scale. Finally the LCA concept will be adopted to validate the sustainability of the developed materials from the point of view of the environmental impact and of the economic sustainability</p>
<p><b>Educational objectives</b></p>	<p>To form a PhD able to drive from the literature the design of innovative polymeric materials to be used in the paper industry for the transition from the usage of oil based product to sustainable ones. At the end of his PhD program the student will acquire:</p> <ul style="list-style-type: none"> <li>• Knowledge and technical skills in the field of sustainable polymer materials</li> <li>• Transferable competencies in the environmental-ecological-sustainable fields that can be used in a broad variety of professional contexts.</li> <li>• Communication (oral and written), scientific project management and planning</li> <li>• Cognitive abilities, problem-solving skills, teamwork skills, empathy and diplomacy.</li> </ul> <p>For the PhD the project will be particularly challenging since it will take into account not only the development of a sustainable chemical polymers at the laboratory but also its implementation at the subsequently industrialization at the MARE Spa.</p>
<p><b>Job opportunities</b></p>	<p>The background of the PhD at the end of his pathway will allow a number of possibilities in companies devoted to the subject sustainability. Being the environmental and sustainable aspects key for the next future, the student will find opportunities in a broad range of companies, not limited to the specific subject studied during his PhD.</p>
<p><b>Composition of the research group</b></p>	<p>1 Full Professors 0 Associated Professors 2 Assistant Professors 10 PhD Students</p>
<p><b>Name of the research directors</b></p>	<p>Prof.Davide Moscatelli</p>



Contacts	
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Additional support - Financial aid per PhD student per year (gross amount)	
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Housing - Foreign Students	--
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Housing - Out-of-town residents (more than 80Km out of Milano)	--
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Scholarship Increase for a period abroad	
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Amount monthly	700.0 €
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By number of months	6
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National Operational Program for Research and Innovation	
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Company where the candidate will attend the stage (name and brief description)	MARE spa - Via G. Verdi, 3, 20010 Asmonte MI <a href="http://www.mare.com">www.mare.com</a>
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By number of months at the company	6
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Institution or company where the candidate will spend the period abroad (name and brief description)	The project promotes collaboration with important international institution (e.g. ETH Zurich, MIT Boston, University of Basque Country). The student will spend a period abroad in one of these Institutions
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By number of months abroad	6
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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.

**Individual budget for research** (during the 3 years): about 5.400 euro

**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.