



PhD in CHIMICA INDUSTRIALE E INGEGNERIA

CHIMICA / INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING - 39th cycle

PNRR 117 Research Field: CIRCULAR AND SUSTAINABLE MATERIALS FOR ELASTOMER NANOCOMPOSITE

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

Elastomer nanocomposites find their main application in tyre compounds. Tyres do have impact on the environment: mainly during their life because of the rolling resistance but also because of the raw materials, which in large part come from fossil sources and are not circular. The role of transport in sustainable development is well recognized by the United Nations
<https://www.epa.gov/sustainability> Main objective of the research is to prepare tyre compounds with circular materials, using biosources and promoting their recyclability. The research aims at preparing novel and innovative materials, suitable to promote innovation in the industrial development thanks to long-term sustainability goals. See <https://www.pirelli.com/global/en-ww/life/sustainability/>. The main objective of the research is to prepare elastomeric materials made from biosources, suitable for compostability or biodegradable, which can meet the demanding requirements of the dynamic-mechanical application of a tyre compound, reducing the dissipation of energy of a tyre during its use. An objective of the research is to prepare functional biosourced materials and elastomeric nanocomposites and to characterize them in view of their final application.

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

For the preparation of the biosourced functional materials, the typical techniques of synthetic organic chemistry will



	be used. In particular, the techniques for wet and solid state synthesis will be used. Processes under vacuum or in inert conditions will be considered. The use of distillation systems and chromatographic purification processes will be carried out. Calorimetric techniques will be used. Mass spectrometry techniques and NMR and infrared spectroscopies will be used for the assessment of the chemical structure and of the degree of purity of the synthesized compounds. Elastomeric nanocomposites will be prepared, based on the mentioned molecules, by using traditional instruments such as internal mixer, and characterized by means of rheological, dynamic-mechanical and tensile tests. Pirelli will be involved in the preparation and characterization of elastomer nanocomposites.
Educational objectives	The activity is aimed at giving to the student high education, allowing him to be able to: (i) perform chemical reactions inspired by the principles of green and sustainable chemistry (ii) design and develop the chemical reactions in view of their scale-up (iii) prepare and characterize low and high molar mass chemicals (vii) prepare and characterize elastomer nanocomposites.
Job opportunities	The Research Doctor will be able to find a location, in particular in R&D Department, both in private and public companies and institutes active in the field of chemical synthesis, preparation of polymer composites, high performance applications.
Composition of the research group	1 Full Professors 3 Associated Professors 2 Assistant Professors 10 PhD Students
Name of the research directors	Prof. S. Galimberti, Dr.ssa V. Barbera

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

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	PIRELLI TYRE S.p.A. Viale Piero e Alberto Pirelli 25, 20126 Milano https://www.pirelli.com
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	German Institute of Rubber Technology. V. (Deutsches Institut für Kautschuktechnologie e. V.) Eupener Str. 33, 30519 Hannover, Germania https://www.dikautschuk.de/
By number of months abroad	6

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

Confidentiality (Agreement with company): 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 (5.700 euro): 1st year: 1.900 euro; 2nd year: 1.900 euro; 3rd year: 1.900 euro

Teaching assistantship (availability of funding in recognition of supporting teaching activities by the PhD student): there are various forms of financial 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.