



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

THEMATIC Research Field: ADVANCED SUSTAINABLE MATERIALS FOR TIRE COMPOUNDS.

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 PhD activity is focused on advanced sustainable materials for tire compounds. Materials will be prepared from biobased chemicals, from wastes and residues and from “circular chemicals”, that means from chemicals coming from chemical recycling, mainly from depolymerization. Studies will be performed to replace the main components of tire compounds, traditionally oil based. Main objective will be reduction of the environmental footprint of the components of the compounds in a lifecycle perspective. In particular, will be studied: elastomers, with the aim to replace the traditional ones, mainly poly(isoprene) and poly(styrene-co-butadiene), reinforcing fillers, with the aim to prepare organic fillers for low dissipation of energy, reinforcing resins, with the aim to replace phenolic resins, protective agents, with the aim to replace aromatic paraphenylene diamines. Techniques to be preferentially used will be: step growth polymerization, organic synthesis inspired to the basic principles of green and sustainable chemistry.. Assessment of chemical, physical and structural properties of ingredients and composites will be realized..

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

The research will be carried out by using experimental techniques and facilities suitable (i) for the synthesis of low molecular mass chemicals and of polymeric substances, (ii) for the preparation and characterization of



	elastomeric composites. A thorough literature survey will be essential part of the work. Analytical techniques such as chromatography, NMR spectroscopy, calorimetry, thermo-gravimetric, infrared, Raman analysis will be used. Tensile and dynamic-mechanical properties of the elastomeric composites will be determined. The thesis will be developed with funding by Pirelli Tire.
Educational objectives	Main objective is to give to the student tools to: (i) perform sustainable chemical reactions (ii) prepare low molar mass chemicals and polymers (iii) prepare polymer composites (iv) characterize organic substances and polymer composites (v) establish structure-property correlations
Job opportunities	The Research Doctor will be able to find a natural location both in private and public companies and institutes active in the field of chemical synthesis, polymeric composite materials, in particular elastomeric materials and in particular in R&D Department, with tools and ability to perform highly innovative activities.
Composition of the research group	1 Full Professors 3 Associated Professors 2 Assistant Professors 9 PhD Students
Name of the research directors	Prof. S. Galimberti, Dr.ssa V. Barbera

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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

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
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Confidentiality (Agreement with company): since this is a thematic scholarship, the management of Confidential Information, Results and their publication are 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 (4.500 euro): 1st year: 1.500 euro; 2nd year: 1.500 euro; 3rd year: 1.500 euro

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