POLITECNICO DI MILANO

PhD in CHIMICA INDUSTRIALE E INGEGNERIA CHIMICA / INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING - 37th cycle

THEMATIC Research Field: SUSTAINABLE ELASTOMER NANOCOMPOSITES

Monthly net income of PhDscholarship (max 36 months)
€ 1325.0 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 elastomer nanocomposites, in particular for dynamic-mechanical applications such as the one in tire compounds. The elastomer nanocomposites will be based on nanometric sp2 carbon allotropes such as carbon black, graphene related materials and carbon nanotubes. One of the main activities will be the functionalization of the sp2 carbon allotropes, which will be essentially performed with biobased substances, with activities in line with the principles of green and sustainable chemistry. Assessment of chemical, physical and structural properties of pristine and functionalized carbon allotropes will be performed. Elastomer nanocomposites will be prepared. Dynamic-mechanical, thermal and electrical properties of the nanocomposites will be investigated, establishing the correlation between properties and structure of the nanocomposite, in particular in view of the application in a tire compound. All the activities will be inspired to the principles of sustainability..
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 for (i) the functionalization and characterization of sp2 carbon allotropes, such as carbon black, graphene related materials and carbon nanotubes (ii) the preparation and characterization of elastomer nanocomposites. A thorough literature survey will be essential part of the

	work. Analytical techniques such as calorimetry, thermogravimetric, infrared, Raman analysis will be used. Dynamic mechanical, electrical and thermal characterization of the elastomeric composites will be performed. Swelling and filler networking studies will be carried out. The thesis will be developed with funding by Pirelli Tire.
Educational objectives	Main objective is to give to the student tools to: (i) perform reactions on nanometric sp2 carbon allotropes as the substrates (ii) characterize the nanometric carbon allotropes (iii) prepare and characterize elastomer nanocomposites (iv) establish structure-property correlations in view of challenging applications, such the one for tire compounds (v) perform a research on materials inspired to the principles of sustainability
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.
Composition of the research group	1 Full Professors 3 Associated Professors 2 Assistant Professors 7 PhD Students
Name of the research directors	Prof. Maurizio Stefano Galimberti

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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	564.01 €
By number of months	6

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