



# PhD in CHIMICA INDUSTRIALE E INGEGNERIA CHIMICA / INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING - 38th cycle

**THEMATIC Research Field: BIOBASED MATERIALS FOR SUSTAINABLE ELECTRONICS**

**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**

Nowadays, there is an increasing demand for electronic functionalities that are fully integrated in everyday objects, in the light of the need for continuous data collection, real time information and connectivity. Growing Continuously growing market segments are consumer electronics, healthcare, wearable electronics. Recycling and/or dismantling of electronic products is hardly done or often requires harsh conditions. Moreover, such electronic products are characterized by short lifetime or are even becoming completely disposable. This exponentially rises the environmental pressure and urgently requires sustainable and responsible production and consumption of electronic, to contribute to climate actions. Biobased materials are of fundamental importance in view of sustainable value chains for printed electronics. The PhD activity will be framed in the European HORIZON Project "Ecotron. How to minimize the environmental footprint for printed electronics", HORIZON-CL4-2021-DIGITAL-EMERGING-01-31. 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. In particular, will be studied: biobased chemicals, polymeric materials, nanosized  $sp^2$  carbon allotropes, polymer nanocomposites. 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, structural, mechanical and electrical properties of ingredients and composites will be realized. Structure-property correlation with typical approaches of materials engineering will be performed
<b>Methods and techniques that will be developed and used to carry out the research</b>	The research will be carried out by using experimental techniques and facilities suitable for the preparation and characterization of polymeric materials. Techniques such as solvent extraction, Infrared and NMR spectroscopies, calorimetry, thermo-gravimetric analysis, tensile tests and electrical measurements will be used. A thorough literature survey will be essential part of the work.. The thesis will be developed with funding by the ECOTRON Project.
<b>Educational objectives</b>	Objective is to give to the student tools to: (i) perform sustainable materials preparation (ii) prepare polymers (iii) prepare polymer composites (iv) characterize low molar mass and polymeric substances (v) perform materials physical-mechanical characterization (vi) establish structure-property correlations (vii) perform a research activity in the frame of a complex environment such as an European consortium.
<b>Job opportunities</b>	The Research Doctor will be able to find a location both in private and public companies and institutes active in the field of polymeric composite materials and in the field of sustainability, at an European level, with tools and ability to perform highly innovative activities
<b>Composition of the research group</b>	1 Full Professors 3 Associated Professors 4 Assistant Professors 8 PhD Students
<b>Name of the research directors</b>	Prof. M. S. Galimberti, Dr.ssa V. Barbera

<b>Contacts</b>	
Telephone: 0039-02-2399-4746 Email: maurizio.galimberti@polimi.it; vincenzina.barbera@polimi.it Web-pages of the research group: <a href="https://www.researchgate.net/lab/ISMaterials-group-Innovative-Sustainable-Materials-group-Maurizio-Galimberti">https://www.researchgate.net/lab/ISMaterials-group-Innovative-Sustainable-Materials-group-Maurizio-Galimberti</a>	



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	662.5 €
By number of months	6

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

**The candidate will have to fill in a mandatory questionnaire in order to close the application**

**Educational activities** (funding for participation in courses, summer schools, workshops and conferences) - financial aid per PhD student per year: 1<sup>st</sup> year: around 1.800 euros per student 2<sup>nd</sup> year: around 1.800 euros per student 3<sup>rd</sup> year: around 1.800 euros per student

**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.