

# PhD in Materials Science and Technology

## Research Title: Bio-based blends development: preparation and characterization

<b>Funded by</b>	Politecnico di Torino
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<b>Context of the research activity</b>	<p>Sustainability, industrial ecology, eco-efficiency, and green chemistry are guiding the development of the next generation of materials, products, and processes. Biodegradable plastics and bio-based polymer products based on annually renewable agricultural and biomass feedstock can form the basis for a portfolio of sustainable, eco-efficient products that can compete and capture markets currently dominated by products based exclusively on petroleum feedstock. It is interesting study and develop bio-Blends and composites based on environmentally degradable-ecocompatible synthetic and natural polymeric materials and fillers of natural origin. Most polymer blends are immiscible and need to be compatibilized. The compatibilization must accomplish: (i) optimization of the interfacial tension; (ii) stabilize the morphology against high stresses during forming; and (iii) enhance adhesion between the phases in the solid state. Compatibilization is accomplished either by addition of a compatibilizer or by reactive processing. The preparation of this new interesting materials will be carried out by using the most known processing methods for thermoplastic polymers in order to have the possibility to obtain materials ready for industrial applications in different fields. The methodology of the research will include also state-of-the-art bio-based blend materials, their processing and characterization techniques.</p>
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<b>Objectives</b>	<p>The objectives of the research program can be summarized as follow:</p> <ul style="list-style-type: none"><li>- To study thermodynamic aspects of bio-based blends in order to select different</li><li>- To prepare the bio-blends by using twin-screw extruder with the optimization of the processing parameters (temperature and screw profiles, rpm, output, residence time, feeder system)</li><li>- To study the effects of chemical and/or physical compatibilization of blends also with the use of nanofillers</li><li>- To study the effect of natural fillers and fibres in the bio-based blends</li><li>- To study the morphology of blends correlated to the different parameters</li><li>- To assess mechanical and barrier properties of the prepared materials</li></ul>
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<b>Skills and competencies for the development of the activity</b>	<p>Candidates should have a chemistry engineering and polymeric material background and high motivation to learn through advanced research. Knowledge in polymer processing and/or polymer characterization is required. Practical attitude for the lab activities and problem-solving skills are also appreciated</p>
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