# CIVIL AND ENVIRONMENTAL ENGINEERING

## CRT (ISSNAF) - Design and Research to Enhance Alternative Materials (DREAM)

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| **Funded By** | FONDAZIONE CRT CASSA DI RISPARMIO DI TORINO [P.iva/CF:06655250014] |
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| **Context of the research activity** | This research project is set against a backdrop of growing environmental concern and the need to reduce the environmental impact of products while stimulating innovation in the materials sector. In particular, the introduction of waste plant materials for the production of innovative materials will be investigated. The adoption of biobased and biodegradable materials emerges as a promising strategy to reduce dependence on plastics and petroleum-derived synthetics. It also helps to counter the accumulation of plastic waste in ecosystems and providing a tangible response to limit environmental impact. In addition, the use of materials considered waste minimizes the use of new raw material resources, promoting an optimized management of existing resources, and sustaining the activation of circular economy practices as alternatives to the extract, make, use and dispose mindset. This research will be carried out in the framework of Material Design discipline with the aim to apply the zero-waste strategy focused on the upcycling of secondary raw materials. |
| **Objectives** | The objective of the research is to identify and test sustainable alternatives to the use of plastics. The study aims to investigate and develop an innovative protocol for the creation of a bio-based and biodegradable material (i.e. bio-composite material) that can effectively replace traditional fossil-based plastics. The research mainly focuses on enhancing and testing the opportunity to use waste plant materials as potential component, or filler, for an innovative bio-composite material.<br>The second goals of this research proposal focuses on conducting laboratory tests in order to analyze and assess potentialities offered by prototypes obtained from the new waste plant-based material. Laboratory tests focus on defining in detail its physical, chemical and mechanical properties. These tests will be conducted to characterize the new waste plant-based material describing its plasticity, malleability, durability, strength, chemical compatibility, and other properties needed to propose a specific design application such as a “ disposable item”, or a “more durable product” based on new material strengths and criticalities.<br>Moreover, this research proposal aims to provide tangible outcomes useful to |

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| | establish new directions and explore creative opportunities in material design innovation and biodesign discipline. |

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| **Skills and competencies for the development of the activity** | The candidate should demonstrate to be familiar with basic laboratory skills to properly perform all research activities, such as operating with laboratory equipment and instruments, and preparing and managing samples and prototypes. The candidate should demonstrate good manual skills, especially in the field of material design that it will be initially performed through the application of a "Do-It-Yourself" approach based on a trials and errors innovation process and hand-on experimentation.<br>The candidate must have an interdisciplinary background in the field of chemistry, mechanical engineering and design. The candidate should also demonstrate basic knowledge in processes of materials engineering, forensic engineering and failure analysis.<br>Knowledge and previous experiences in similar research activities are appreciated.<br>Fluent English language is requested and mandatory.<br><br>The research topic will be developed in collaboration with a faculty member from ISSNAF (Italian Scientists & Scholars in North America Foundation), as part of the collaboration agreement signed with the Politecnico di Torino.<br>The grant is founded by CRT inside ISSNAF program. The selected candidate must spend at least 12 month in north America partner University. |