



PhD in INGEGNERIA DEI MATERIALI / MATERIALS ENGINEERING - 38th cycle

PARTENARIATO PNRR Research Field: BIO-RELATED MATERIALS FOR SUSTAINABLE FASHION DESIGN.

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

**PARTENARIATO PNRR MICS (3A-ITALY)
PARTENARIATO ESTESO MADE IN ITALY
CIRCOLARE E SOSTENIBILECUP**

D43C22003120001 Decreto di concessione: D.D. 1551 del 11/10/2022 **Spoke n.4**

Leather is a traditional material, symbol of quality fashion. Its production employs animal-derived products, and harsh chemicals and processes; the technology behind this material do not fit the idea of sustainability and circularity.

The proposed Ph.D. project will face the challenge to produce innovative materials that include the principles of sustainability, by upcycling waste products and following green approaches. To this aim, the bio-based production of materials and the bioengineering tools will be considered to bring alternatives to the massive use of animals and animal farming.

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

This project empowers the synergy of the expertise deriving from different fields of material science, chemistry and bioengineering to produce creative and innovative materials alternative to the traditional animal-derived leather.

The ambition is either to innovate the typical sector of use of leather and bring new applicative horizons in the direction of wearable and smart clothing accessories.



	<p>direction of wearable and smart clothing accessories. Three different research groups will join to compose a multifaceted approach by combining:</p> <ol style="list-style-type: none"> 1. non-conventional additive manufacturing techniques to produce composite materials and multimaterials for fashion, home design, and furniture, starting from the waste produced in the same sectors following circular economy approaches 2. the out-of label use the techniques deriving from tissue engineering knowledge and expertise, including the use of living (micro)organisms in dynamic automatized processes. The project employs dynamic culture environment, controllable and reproducible, essential in improving nutrient supply and waste removal to sustain large 3-D construct development. 3. push the use of natural, not animal-derived, materials out of the borders of health-related application, empowering the mechanical performance and controlling their degradative profiles with the innovative technologies described in the point 1.
Educational objectives	<p>The educational objectives are within the frame of growing professionals able to employ the material-structure correlation by controlling it with the use of processing technologies plus material production, and innovate them. The acquired knowledge will positively impact on the industrial scenario of sustainable and green technologies of Made in Italy manufacturing. The multidisciplinary approach will fuel the creativity mindset of the Ph.D. graduate to the efforts of circular economy and sustainability.</p>
Job opportunities	<p>The acquired skills enable the Ph.D. graduate to be fully in line with the trending directions of the innovative industrial approach that considers the social impact. The expertise regarding bio-derived innovative materials opens up vast opportunities in all the sectors where materials are employed. The creativity and</p>



	multidisciplinarity bring the Ph.D. graduate to fit particularly well the start-up environment.
Composition of the research group	1 Full Professors 2 Associated Professors 1 Assistant Professors 3 PhD Students
Name of the research directors	Proff.sse M. Levi – S. Mantero – P. Petrini

Contacts	
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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	662.5 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>The candidate will have to fill in a mandatory questionnaire in order to close the application.</p> <p>Individual budget for research (during the 3 years): 1st year: about 1.800 euro 2nd year: about 1.800 euro 3rd year: about 1.800 euro</p> <p>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.</p>