CHEMICAL ENGINEERING

Ammin/DISAT - Agro-Urban Mining and Biorefineries: Valorization of Agro-Industrial Residues for the Extraction of High-Value Products and Critical Materials

Funded By	Politecnico di Torino Dipartimento DISAT FINPIEMONTE S.P.A. [P.iva/CF:01947660013]
Supervisor	FINO DEBORA - debora.fino@polito.it
Contact	
Context of the research activity	Study of processes for the production of high value-added products, considering process analysis and life cycle assessment. The topic of the thesis will be developed through an experimental and modeling approach. Borsa di dottorato cofinanziata dal progetto 1092/2024 Bando SWIch - FIBRA - Studio e sviluppo di pastiglie freno con fibre sostenibili - Domanda 965 - 297 - CUP: E13D23000840006.
Objectives	This research project explores the concept of agro-urban mining within the context of biorefineries. It will focus on the identification and characterization of agro-industrial residues (agro-waste and by-products) in terms of chemical composition and availability. The potential for extracting high-value products, fibre and critical materials from these residues will be assessed through experimental analysis, contributing to the development of new value chains based on the circular bioeconomy. Following the extraction process, the remaining residues will be further valorized through biorefinery processes to produce energy (bioenergy) and materials (biopolymers, biofuels, fertilizers, etc.), ensuring optimal resource utilization and minimizing environmental impact. The study will be supported by experimental activities and environmental impact assessment through the Life Cycle Assessment (LCA) methodology to evaluate the sustainability of the proposed solutions and provide guidelines for implementing circular models in agro-industrial and urban contexts. Main Objectives: 1. Identification and characterization of agro-industrial residues and by-products in terms of quantity and chemical-physical composition. 2. Extraction of high-value products through innovative processes. 3. Valorization of remaining residues through biorefinery processes for energy and material production. 4. Environmental sustainability assessment using the LCA methodology. This project aligns with circular economy strategies and the ecological

	transition, contributing to waste reduction and the valorization of residual resources through integrated and sustainable processes.

Skills and competencies for the development of the activity	Chemical engineering fundamental, life cycle assesment, literature review expertise, biochemical processing, english writing and speaking.