

CHEMICAL ENGINEERING

DISAT - Extraction and processing of lipids from unconventional, sustainable sources

Funded By	Dipartimento DISAT
Supervisor	SIMONE ELENA - elena.simone@polito.it
Contact	PARISI EMMANUELE - emmanuele.parisi@polito.it
Context of the research activity	The candidate will develop experimental, processing strategies to extract, purify and functionalize the lipid fraction contained in agri-food residues such as rice bran, wheat germ oil and coffee grounds.
Objectives	Fats are a class of micronutrients essential for the human diet. Fats are an efficient source of energy, providing more than double the calories contained in the same mass of carbohydrates or proteins. Fats are key components of cell membranes and they are essential for the absorption of fat-soluble vitamins A, D, E, and K. They also provide essential fatty acids (e.g., linoleic, linolic) needed for brain development, controlling inflammation, and blood clotting. Finally, fats protect vital organs and insulate the human body. Fats are also essential ingredients, they provide flavour, texture, and mouthfeel to fat-based food products, making them more palatable and satiating. Fat crystal networks contribute to create the sub-nano, nano and microstructures of food, which are responsible for imparting functional properties such as moistness, crispiness and creaminess as well as for digestion modulation (e.g., protection and controlled release of fat-soluble vitamins and micronutrients, feeling of satiety). However, the most commonly used fats are linked to environmental (e.g., animal fats), deforestation (e.g., palm), biodiversity (e.g., coconut) and traceability (e.g., tropical fat mixtures) issues. To tackle such issues it is necessary to find more sustainable sources of fats and develop manufacturing processes for the extraction and purification of the extracted lipids. In this experimental project lipid-rich agri-food residues (e.g., rice bran, wheat germ, coffee grounds) will be studied as novel, unconventional sources of fats. Several extraction (e.g., supercritical fluids, microwave) and processing (e.g., enzymatic reactions, fractionations) techniques will be explored. Extracted and purified materials will be characterized with multiple techniques including differential scanning calorimetry, X-ray diffraction and chromatography. Tecno-economic analysis and life cycle assessments will be conducted to evaluate the cost effectiveness and sustainability of the technical solutions designed.
Skills and competencies	

**competencies
for the
development of
the activity**

MSc degree in chemical engineering, some experience with lipid characterization and extraction is desirable.