

CHEMICAL ENGINEERING

LAVAZZA - Advanced selective molecular separation technologies applied to coffee extracts for target compound removal

Funded By	LUIGI LAVAZZA S.P.A. [Piva/CF:00470550013]
Supervisor	FINO DEBORA - debora.fino@polito.it
Contact	
Context of the research activity	This research activity is positioned within the growing consumer-driven trend of beverage customization, which is increasingly shaped by health-related needs, sensory preferences, and lifestyle factors. The project aims to develop a novel selective molecular filtration technology capable of modulating the chemical composition of coffee beverages in real time, enabling personalized coffee experiences while preserving beverage quality and sensory attributes.
Objectives	The objective of the PhD project is to investigate and develop advanced membrane-based separation technologies capable of selectively removing specific compounds, such as caffeine and carbo-5-hydroxytryptamides, from coffee beverages while preserving aroma, flavour, body and overall sensory perception. The research activity is further aimed at enabling the integration of the filtration system into coffee dispensing systems. To minimise environmental impact, solutions should use filtering materials that are long-lasting and reusable. The research activity will be structured into the following main phases: a) Material design and development of novel membrane architectures exhibiting high chemical resistance and thermal stability, while ensuring the absence of release of substances potentially harmful to food products; b) Investigation of mass transport mechanisms and selective adsorption/separation phenomena. Characterization of membrane performance in terms of selective permeability toward target compounds, as well as morphological, structural, and transport properties. Their long-term stability will be assessed by means of accelerated ageing tests; c) Development of membrane regeneration strategies and assessment of lifecycle performance, with particular attention to consumer-use applicability; d) Implementation of the laboratory-developed membranes in the filtration process of coffee beverages.
Skills and competencies for the	Chemical engineering and processing, Materials science and engineering, Membrane science and technology, separation processes, analytical

for the
development of
the activity

chemistry techniques, experimental design and data analysis, literature review expertise, English writing and speaking.