

Optimization and Evaluation of the Oil Extraction Process Using Supercritical CO₂ and Co-solvents from Spent Coffee Ground

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Abstract : The generation of urban waste is a consequence of human activity, and the fraction of urban organic waste is one of the major components of municipal waste. The development of new materials and energy recovery technologies is becoming a thriving topic throughout Europe. ITENE is working to increase the circularity of coffee grounds from West Macedonia. Although these residues have a high content of carbohydrates, fatty acids and polyphenols, they are usually valorized energetically or discarded, losing all these compounds of interest. ITENE is studying the extraction of oils from spent coffee grounds using supercritical CO₂, as it is a more sustainable method and does not destroy the most valuable compounds. In the HOOP project, the extraction process is optimized to maximize oil production and the possibility of using co-solvents together with supercritical CO₂ is studied. The production of fatty acids by scCO₂ extraction is optimized and then compared with other conventional extraction methods such as hexane extraction and the Folch method. The conditions for scCO₂ were temperatures of 313.15K, 323.15K and 333.15K, pressures from 150 bar to 200 bar, and extraction times between 1 and 3 h. In addition, a complete characterization of the resulting lipid fraction is performed to evaluate its fatty acid content and profile, as well as its antioxidant properties, lipid oxidation, total phenol content and moisture.

Keywords : Supercritical co₂, coffee, valorization, extraction

Conference Title : ICWM 2025 : International Conference on Waste Management

Conference Location : Prague, Czechia

Conference Dates : March 10-11, 2025