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Biorefineries for valorization of food and agricultural residues using advanced technologies

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The agri-food industry produces large amounts of wastes in their daily activities that are usually disposed without further usage, including peels, bagasse, pulp, seeds, leaves, husks, etc. However, most of the “wastes” from such activities still contain large quantities of valuable chemical compounds, such as oils, antioxidants, coloring and flavoring agents, carbohydrates, etc., that find applications in nutrition, medicine, food technology, chemical engineering and energy, among other areas. In the context of a biorefinery, one of the main objectives is to maintain an optimal balance between increases in manufacturing output and costs while minimizing the environmental impact of the industry. The integration of advanced processes based on supercritical fluids allows obtaining several different products sequentially from the same raw material (derived from the main activity) using environmentally friendly processes. By exploring temperature and solvent polarity gradients and green solvents (water, ethanol, CO₂, etc.) specific compounds with a wide range of polarity (from hydrophobic oils to hydrophilic coloring agents) are selectively removed producing highly concentrated extracts. Other processes using supercritical fluids may also be integrated into the biorefinery to produce nanoparticles and to reuse the solvent. From the residue generated by the extractions is also possible to separate lignin from cellulose and hemicellulose and perform the hydrolysis to produce phenolic compounds and fermentable sugars. The remaining solid can then be subjected to gasification producing hydrogen or methane. Case studies of this strategy applied to natural products (sugar cane, pressed palm, turmeric and grapes) are presented to illustrate the concept.

Biography

Mauricio A Rostagno has obtained his PhD from University of Cadiz, Spain and Post-doctoral studies from University of Campinas (UNICAMP) at the School of Food Engineering. He is an Assistant Professor of the School of Applied Sciences of UNICAMP lecturing about food composition and analysis. He has published more than 39 papers in reputed journals and also edited the book “*Natural Product Extraction: Principles and Applications*” published by Royal Society of Chemistry.

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