

Chemistry Department



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Valorization of coffee residues using Supercritical CO₂



Objectives

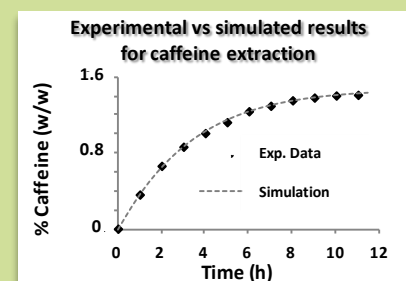
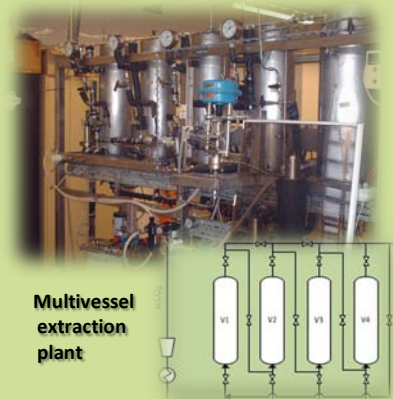
- Optimization of caffeine extraction from green coffee beans assisted by supercritical carbon dioxide (scCO₂) in a high pressure pilot plant;
- scCO₂ regeneration with new high specific adsorbents for caffeine;
- Dynamic modeling and optimization of integrated multivessel “counter-current” supercritical extractions governed by both diffusion and solubility limitations;
- Valorization of waste residues from coffee industry.

Methodology

- Extraction added-value compounds from solid coffee waste using a multivessel extraction unit at high pressure with carbon dioxide;
- Evaluation of new process conditions and configurations of caffeine extraction from green coffee beans;
- Integrated process of oil extraction and biodiesel synthesis using biocatalysis in supercritical medium;
- Evaluation of hydrodynamics, heat and mass transfer of packed bed extractors and reactors, structured columns at high pressure conditions .

Expected Results

- Development of mathematical models of the complete process of decaffeination with data gathered from the experiments;
- Development of scale-up procedures for different limited extractions phenomena;
- Development of computational fluid dynamic models of extraction equipment for supercritical processes, e.g., extractors, structured packed columns and static mixers;
- Economic evaluation of high pressure extraction process.



CFD Heat Transfer study in static mixers

