Research Projects for Master Students
Laboratory of Nutraceutics and Delivery
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Exploring the potentiality of combining environment-benign ionic liquids and supercritical CO_2 for the selective extraction of bioactive compounds from natural matrices

The search for green solvents and processes especially for applications related with products for human consumption is a major challenge concerning chemists and engineers all over the world. Ionic liquids and supercritical CO_2 are two classes of fascinating, environment-benign solvents with unique properties that are attracting a lot of interest within a large variety of applications in all areas of the chemical industries.
Ionic liquids are liquid salts made up of two components (the anion and cation) which can be varied, allowing the solvents to be designed with a particular set of properties. One of the problems in using ionic liquids as a solvent in an extraction process is that it is often difficult to separate the products from the solvent. In this work, the possibility of performing a primary extraction with ionic liquids to recover natural bioactive compounds from solid matrices, followed by a second step separation of the products with supercritical CO_2, will be explored.

Preparation of cellular -active delivery systems using supercritical CO2 technology

The cell membrane is a major barrier for drug transport into cells. Passage of molecules across this barrier is highly regulated and highly restricted, with particle size and carrier selection comprising the most important issues to address. In this project supercritical CO_2 technology will be explored in order to prepare nanoparticle-based drug delivery systems using cellular penetrating carriers like peptides. Supercritical CO_2 technology allows the production of particles with controllable morphology, narrow size distribution, and low static charge and is making in-roads in the formulation of particulate drug delivery systems, such as microparticles and nanoparticles, liposomes, and inclusion complexes, which control drug delivery and/or enhance the drug stability. The possibility of preparing drug delivery systems with enhanced cellular up-take using supercritical CO_2 technology will be investigated.