TITLE OF THESIS : ***« Development of solutions combining deep eutectic solvents and cyclodextrins for the solubilization of essential oils and aromas.»***

ABSTRACT :

Essential oils and aromas are natural molecules that are widely used in different industries due to their diverse biological activities. However, their low solubility and high volatility limit sometimes their application. Deep eutectic solvents (DESs) are green solvents with great potential as an alternative to organic solvents for the solubilization of hydrophobic molecules. Cyclodextrins (CDs) are natural cage molecules widely used for the improvement of the aqueous solubility of encapsulated guests. This work aims to develop new formulations by combining DESs, water and CDs, by varying the water content, the type of DES, the molar ratio of the DES constituents, as well as the nature of the CD (native, modified or polymer of CDs). These formulations were characterized by density, viscosity and polarity measurements. Their solubilization capacity was evaluated by measuring the volatility reduction of a model essential oil E. citriodora. The results allowed to define an optimal formulation, choline chloride:urea DES:water 70:30 wt% in the presence of CDs, which was used for the solubilization of twenty essential oils and twenty-one aromas. In addition, the CD/aroma complexes were characterized in this formulation by different analytical techniques (headspace static-gas chromatography, nuclear magnetic resonnance and isothermal titration calorimetry). Isothermal titration calorimetry studies conducted on a model inclusion complex system β-CD/adamantanol have allowed the characterization of the thermodynamic properties of the complexation phenomenon within a DES:water formulation. The results of this work show that these new formulations possess promising performance in the solubilization of hydrophobic compounds.