

Ecole Doctorale des Sciences Fondamentales

Title of the thesis: Biosources switchable solvents for CO₂ remediation.

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Summary :

Carbon dioxide issued from anthropogenic emissions, strongly takes part in the adverse effects of global warming. Nowadays, the Carbon Capture Utilization and Storage (CCUS) process based on chemical absorption in an aqueous solution of alkanolamine is one of the most mature technologies. However, this process is energy intensive and needs to be improved. Moreover, the utilization of a volatile amine is rising the question about the environmental impact of this solution.

Neoteric solvents with Switchable Hydrophilicity Solvents (SHS) have been proposed as a promising alternative to aqueous solutions of alkanolamines. These solvents undergo a liquid-liquid phase separation when increasing temperature. The Ph.D. student will investigate new bio-sources solvents possessing switchable properties when mixed with water in presence of CO₂.

In continuation with the primary investigations realized in our laboratory, the candidate will have to determine physicochemical properties of such partially miscible systems. In particular, the composition of each phase will be determined by titration, spectroscopy, and chromatography. The goal of the project is to evaluate the capacity of these new solutions for CO₂ capture and to understand the mechanisms driving the phase separation.

For that purpose, the Ph.D. student will take advantages of experimental devices of the laboratory to measure transport, energetic and physico-chemical properties in various conditions of temperature and pressure. He/she will also implement new experimental protocols to determine the speciation of the solutions.

Prerequisite is a Master in physical chemistry or equivalent. We are looking for highly motivated person, interested in research with skills in experimental developments.