Virtual DCMIC Seminar Series 2021

Carbon Capture and Storage (CCS) is a solid option for CO_2 mitigation in the atmosphere. One solution on already built fixed sources is the CO_2 capture using absorbent solutions followed by storage in secured sites. The most mature capture processes are based on selective absorption/desorption cycles of gas into aqueous solutions of amines [1]. In France, the reference amine is the monoethanolamine (MEA) which is known to be very efficient for separating CO_2 from other gases in fumes. However, the cost of CO_2 treatment and the environmental impact of such classical alkanolamines is a strong limitation for the use of this technology.

This presentation will show an overview of the work done during the last decade in the thermodynamic laboratory of Clermont-Ferrand on this crucial problem, thanks to experimental physico-chemical measurements and thermodynamic modeling [2].

Results obtained using calorimetry will be shown, with large details given on the enthalpy of mixing between CO_2 and the aqueous solutions. We will also demonstrate and illustrate how physicochemical methods and thermal analysis can be adapted to get new and original data on such systems. Finally, first results obtained by Infrared spectroscopy will show how the speciation in solutions can by followed with time.

Starting with classical aqueous solutions of alkanolamines, we will show different systems to demonstrate new breakthrough strategies that can be used to reduce the cost of the process, by changing the solvent or using new approaches based on phase separation processes.

References:
1. A. Abbas, and Coll, Absorption-Based Post-combustion Capture of Carbon Dioxide, Woodhead Publishing, 2016, Page iv, https://doi.org/10.1016/B978-0-08-100514-9.12001-3.
2. Coulier, Y., Ravisy, W. , Andanson, J. , Coxam, J. and Ballerat-Busserolles, K. (2019). Experiments and Modeling for CO2 Capture Processes Understanding. In Cutting-Edge Technology for Carbon Capture, Utilization, and Storage (eds K. Ballerat-Busserolles, Y. Wu and J.J. Carroll). doi:10.1002/9781119363804.ch16.

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Innovative experimental Physico-Chemical approach to contribute to post-combustion CO_2 Capture

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