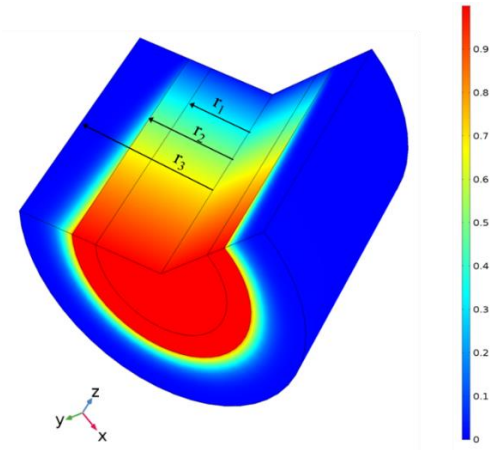
CO_2 absorption with ionic liquids (Ils) in a hollow fibre membrane contactor (HFMC)



Dimensionless concentration of CO_2 in a hollow fibre with [emim][EtSO4] in steady state

Experimental and modelling approaches were carried out for the absorption or adsorption-desorption of CO_2 with imidazolium- or amino acid-based ILs in HFMCs. Complete mathematical models (isothermal and non-isothermal) in steady-state and transient regimes in 2D and 3D were developed and used to validate experimental sorption and desorption results and then to study the influence of structural and operating parameters on the efficiency of the CO_2 capture process.

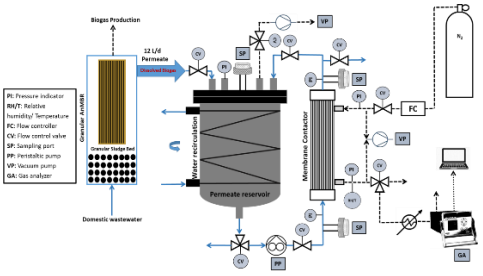
● *CO2 capture with room temperature ionic liquids; coupled absorption/desorption and single module absorption in membrane contactor*. S. Qazi, J.M. Vadillo, L. Gómez-Coma, J. Albo, S. Druon-Bocquet, A. Irabien, J. Sanchez-Marcano. Chem. Eng. Sci. **2020**, 223, 115719.

● *Post-combustion CO2 capture by coupling [emim] cation based ionic liquids with a membrane contactor; pseudo-steady-state approach*. S. Qazi, J.M. Vadillo, L. Gómez-Coma, J. Albo, S. Druon-Bocquet, A. Irabien, J. Sanchez-Marcano. Int. J. Greenhouse Gas Control, **2020**, 99, 103076.

● *Rigorous Non-Isothermal Modeling Approach for Mass and Energy Transport during CO2 Absorption into Aqueous Solution of Amino Acid Ionic Liquids in Hollow Fiber Membrane Contactors*. S. Qazi Sohaib, A. Muhammad, M. Younas, M. Rezakazemi, S. Druon-Bocquet, J. Sanchez-Marcano. Sep. Pur. Technol. **2021**, 254,117644.

● *Solubility and diffusivity (constant & variable) of CO2 in 1-ethyl-3-methylimidazolium cation based ionic liquids; isochoric pressure drop approach*. Q. Sohaib, M. Amin Kazemi, C. Charmette, J. Cartier, M. Rezakazemi, J. Sanchez-Marcano. Fluid Phase Equilib. **2023**, 563, 113581.

Recovery of biomethane dissolved in effluents



Anaerobic membrane bioreactor and membrane contactor coupling for dissolved methane recovery

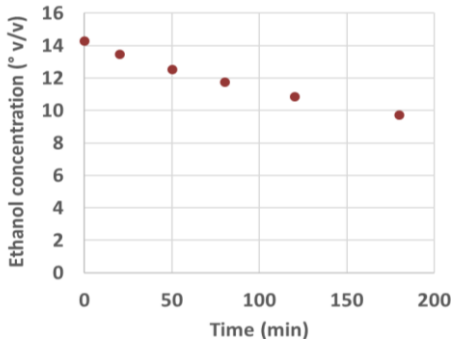
Municipal wastewaters can be treated in an anaerobic membrane bioreactor to produce biogas. However, depending on the temperature conditions, some of the methane remains dissolved in the permeate. Coupling with a membrane contactor enables a large proportion of this dissolved methane to be recovered. This process can also be used to control, supply (oxygenation, ozonation, etc.) or eliminate other dissolved gases (H_2S, NH_3, O_2, etc.).

● ANR Baman **(2019-2022)** Traitement des eaux à énergie positive par bioréacteur à membrane anaérobie

● *Hollow-fiber membrane contactor for biogas recovery from real anaerobic membrane bioreactor permeate,* Q. Sohaib, C. Kalakech, C. Charmette, J. Cartier, G. Lesage, J-P. Méricq, Membranes 12, **2022**, 112

● *Fouling and clogging behavior of porous membrane during biogas recovery from submerged granular anaerobic membrane bioreactor permeate: long-term stability analysis*, Q.Sohaib, C. Charmette, J. Cartier, G. Lesage, J-P. Méricq, Journal of Water Process Engineering 53, **2023**, 103717

Recovery of organic compounds and desalcoholization

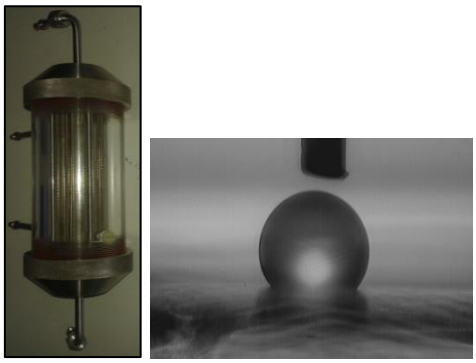


Reduction of alcohol content of a hydro-alcoholic solution at 30°C by membrane contactor

Development of a separation process for recovering volatile organic molecules from an aqueous solution is a challenge in terms of protecting the environment and protecting resources. Such a process could also have interesting applications in biotechnology (recovery of volatile biomolecules obtained during reactions catalysed by microorganisms). It could also be used in oenology to reduce the alcohol content of wine.

● *Beverage dealcoholization by stripping gaz-liquid membrane contactors,* J. Sanchez-Marcano, J-P. Méricq, E. Zurob, M-P. Belleville, Euromembrane 2022, 20-24 nov **2022**, Sorrento, Italie.

Membranes for membrane distillation



Metal hollow fibre membrane contactor (left) and contact angle on super-hydrophobic polymeric membrane (right)

Membrane distillation is a process that can be applied to concentrate solutions in food industry or for water production by seawater desalination. This topic is focused on the development of new super-hydrophobic polymer membranes using a phase separation process, as well as the development of new metallic hollow-fibre membrane modules that can act as an electrical resistance to limit temperature polarization phenomena thanks to the Joule effect. Mathematical modelling of transfers using series resistance models has made it possible to identify the limiting parameters of the process and to simulate the optimum operating conditions.

● *Sweep gas membrane distillation in a membrane contactor with metallic hollow-fibers*, S. Shukla, N.E. Benes, I. Vankelcom**,** J.P. Méricq, M.P. Belleville, N. Hengl, J. Sanchez Marcano, Journal of Membrane Science 493 (**2015**) 167-178,

● ANR WETMEM (**2014-2018**) Nouvelles membranes et outils pour une meilleure compréhension, Modélisation et contrôle du mouillage de pores en distillation membranaire pour le dessalement d'eau de mer

● *Super-hydrophobic polymeric membrane preparation for membrane distillation by non-solvent induced phase separation,* J-P. Mericq, S. Gosset, D. Bouyer, 10th World Congress of Chemical Engineering, 1-5 oct. **2017**, Barcelona, Spain

● *Process intensification by coupling the Joule effect with pervaporation and sweeping gas membrane distillation,* S. Shukla, J-P. Méricq, M-P. Belleville, N. Hengl, N. Benes, I.F.J. Vankelecom, J. Sanchez-Marcano, Journal of Membrane Science 545, **2018,** 150-157