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Membrane crystallization of valuable salts from waste streams

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Crystallization is an example of the technological evolution of a unit from the conventional operation to the high-efficiency process. Crystallization is a widely used unit operation for the separation and/or purification of crystalline solid products. Membrane crystallization aims at reaching the production or recovery of crystals by means of incorporating the novelty of the membrane technology instead of the traditional equipment. The removal and reduction of both anthropogenic emissions of greenhouse gases and pollutant disposals is one of the challenges of humanity must face. Membrane crystallization is presented as a promising technology to solve this issue. It can be used alone or in combination with other technologies, leading to reach synergy effects. In this work, synthetic salt aqueous solutions (Na_2CO_3, Na_2SO_4 and KNO_3) have been treated using osmotic membrane distillation aiming to crystallize the salts. The influence of concentrations, flow rates and impurities were studied in order to demonstrate the potential of this technique, not only for crystal production but also to recover valuable compounds from wastewaters. Results of trans-membrane fluxes, mass transfer coefficients and crystal morphology proved the technical feasibility, making this technology an interesting alternative because of its low energy consumption, the high surface area per volume and its easy scale-up.

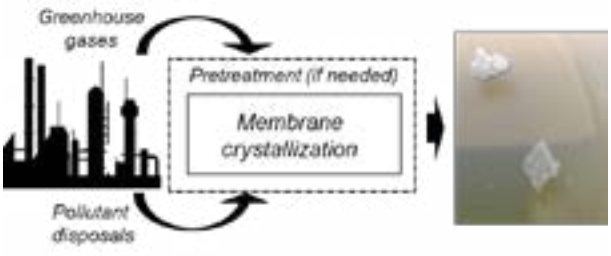

Fig 1 : Membrane crystallization scenario.

Biography

Israel Ruiz Salmón graduated as a Chemical Engineer in 2013 and completed his Master Degree in Chemical Engineering with thesis on "Sustainable Consumption and Production" in 2014, at Universidad de Cantabria (Spain). From 1st October 2014, he started his PhD in Science and Technology under the supervision of Patricia Luis at Université catholique de Louvain (Belgium). The main objective of the thesis is to develop an integrated strategy combining several membrane-based technologies in order to capture CO_2 from flue gases from combustion processes. Besides, this scenario also includes the use of membrane distillation/crystallization to obtain a product (i.e., salts) that can be reused in the industry as raw material (e.g., ceramic and cement industry). Laboratory work is combined with modeling and simulation from technical, economic and environmental point of view. His background also includes teaching collaboration at Université catholique de Louvain.

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