Characterization of nanofiltration membranes in liquid CO_2.

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Abstract.

The use of green solvents to extract and separate valuable compounds has been a topic of general interest in the last years. Traces of organic solvents are undesirable in pharmaceutical or fine chemistry products. In that sense, supercritical CO_2 has been widely used to extract and separate solutes as an alternative to chlorinated solvents. So far, known studies in membrane technology are focused mainly on the use of supercritical CO_2 as a solvent without considering subcritical conditions. Apart from its low viscosity and low surface tension, subcritical fluids require more moderated operating conditions than supercritical fluids. All of this represents a potential and a challenge to investigate those processes as an alternative way to improve the quality of the chemical products.

This work deals with the characterization of commercial polymeric nanofiltration membranes. The experiments were performed in a 40 cm^2 cross-flow unit with transmembrane pressure between 1.0 and 2.0 MPa. All data were collected under steady state conditions with recirculation of permeate and retentate. The permeation flux of liquid CO_2 and the rejection of specific compounds were studied under different conditions of pressure, temperature and concentration of solute. These results make it possible to understand the transport of CO_2 and solutes through the membrane and how the interaction between the CO_2 and the polymeric material can change the internal structure.