Poly(Ionic Liquid)s for CO_2/Light Gas Separation: Membrane Design and Evaluation

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The topic of global warming is one of the most important environmental issues that our world faces today. The adoption of the 2016 Paris Protocol on climate change makes the reduction of greenhouse gas emissions from industrial sources, through carbon dioxide (CO_2) capture and re-use/storage, crucial. Hence, effective removal of CO_2 from process streams containing other light gases such as CH_4, N_2, and H_2 is of vital importance, representing an ongoing chemical and economical engineering challenge faced by the natural gas, electrical energy, and syngas production sectors. Considering the broad range of possibilities of ionic liquid (IL) chemistry, and the undeniable engineering and economic advantages of membrane technology, there has been growing interest in the exploitation of IL-based materials for CO_2 separation membranes [1]. The use of the structure–property relationship of ILs enables the molecular control of their remarkable CO_2-affinity, while the use of IL-based supramolecular networks, like poly(ionic liquid)s (PILs), allows the introduction of structural material features relevant for CO_2/light gas separation. In this communication, we will present a perspective of different straightforward strategies to design efficient CO_2 selective membranes based on PILs, ILs, and their composites (PIL-IL) [2-4]. The intent is to show the versatility of these ionic materials, point up their easy preparation, and reveal insights into the relationships between PIL structure and gas transport properties. We here focus on a variety of PILs bearing different polycations, anions, and polymer molecular weights. Based on the data obtained, the CO_2 separation efficiencies of different membranes will be discussed, as well as breakthroughs and key challenges in this field.

References:

[1] L.C. Tomé, I.M. Marrucho, *Chem. Soc. Rev.* (2016), 45, 2785-2824.
[2] L.C. Tomé *et al.*, *J. Membr. Sci.* (2013), 428, 260-266.
[3] L.C. Tomé *et al.*, *J. Membr. Sci.* (2015), 486, 40-48.
[4] L.C. Tomé, *et al., J.Membr. Sci. (2015), 483, 155-165.*