Two and Three-component Iongel Membranes for CO_2 Separation Applications

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Taking into account the extremely broad range of chemical and structural possibilities of ionic liquid (IL) chemistry, and the undeniable engineering and economical advantages of membrane technology, there has been growing interest in the exploitation of ionic liquid-based materials for CO_2 separation membranes [1].

The use of the structure–property relationship of ionic liquids enables the molecular control of their remarkable CO_2-affinity, while the use of polymer-based networks allows the introduction of structural material features relevant for effective CO_2 removal from process streams containing other gases, such as CH_4, N_2 and H_2.

In this communication, a perspective on different strategies to design CO_2 selective iongel membranes consisted of polymers, ionic liquids and porous fillers will be presented [2-4]. The membranes were prepared either by casting or UV polymerization in the presence of different ionic liquids bearing fluorinated or cyano-functionalized anions. The compatibility and miscibility of the different iongel components were evaluated. The obtained membranes were characterized in terms of structural, thermal, mechanical and morphological properties. Single gas permeation experiments were performed and the results compared to the Robeson's upper bound limits.

The aim is to show the versatility of these materials, point up their easy preparation, and reveal insights into the relationships between gas transport properties, ionic liquid structures, polymer features, diverse porous particles and iongel compositions. What is more, breakthroughs and key challenges on polymer-based iongel membranes will be discussed, as well possible paths for future research.

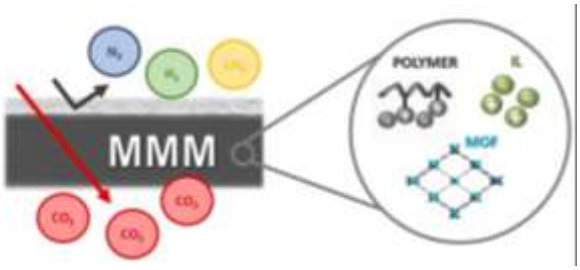

Figure 1: SEM image and schematic representation of a three-component mixed matrix membrane consisting of poly(ionic liquid) (PIL), ionic liquid (IL) and porous filler (MOF).

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