Two and Three-component Iongel Membranes for CO_2 Separation Applications

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Ionic liquids (ILs) have undoubtedly found their place as new functional materials. In particular, and due to their remarkable CO_2 affinity, as well as tuneable nature, there has been a growing interest in the exploitation of IL-based materials for CO_2 separation membranes [1]. In this context, the development of iongel membranes, with a high IL content (>60 wt%) is a promising strategy to obtain high gas separation performances, while at the same time overcome the stability issues reported for supported IL membranes or the limitation in the IL/polymer composition of poly(ionic liquid)-based membranes.

In this communication, two and three-component iongel membranes consisted of a cross-linked polymer network (PEGDA), ionic liquids (ILs), and azo-linked porous organic polymers (azo-POPs) will be presented [2-3]. The membranes were prepared by UV-initiated free radical polymerization. The compatibility and miscibility of the polymer network, different ILs and azo-POPs were evaluated. The obtained cross-linked iongel membranes were characterized in terms of structural, thermal, mechanical and morphological properties. Gas permeation experiments were also performed and the results were 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, IL structures, diverse azo-POPs and iongel compositions. Breakthroughs and key challenges will be discussed, as well as possible paths for future research.

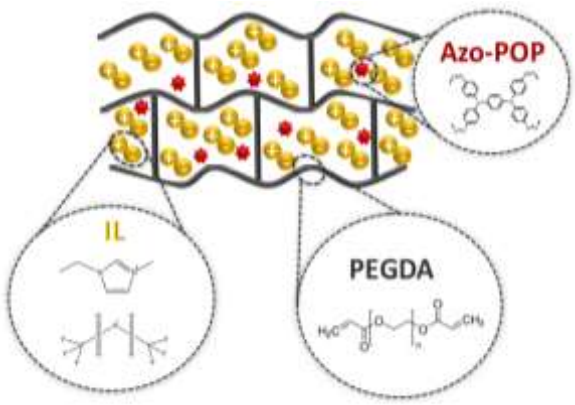

Figure 1 Schematic representation of a three-component mixed matrix membrane consisting of poly(ethylene glycol) diacrylate (PEGDA), ionic liquid (IL), and azo-linked porous organic polymer (azo-POP).

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