

# Ringling the changes in PIM topology

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## Abstract:

Reported performance data for polymeric membranes often show wide variations for notionally the same polymer. This may be due to differences in the experimental conditions, or in the history of the membrane, but it may also arise because of differences in the polymer itself. As well as having a distribution of molar masses, a polymer may exhibit a variety of topologies, including linear, cyclic, branched, tadpole and network architectures. For Polymers of Intrinsic Microporosity (PIMs), such as the archetypal PIM-1<sup>1</sup> and the pyridinecarbonitrile-containing PIM-Py,<sup>2</sup> the distribution of topologies has a profound effect on membrane performance and ageing behaviour.

This is of particular importance in thin film composite (TFC) membranes,<sup>3</sup> which are more relevant to commercial application than the relatively thick films that are often studied in academic laboratories. In gas separation, the presence of a network component may enhance selectivity, but can also lead to a catastrophic loss of long-term performance. However, careful control of polymerization conditions can yield polymer with an optimum topology for exceptional and stable permeation properties.

Defects associated with branching in PIMs allow for interactions with certain metal salts, providing a mechanism for crosslinking the polymer. This can be used to stabilise PIM membranes for use in organic/organic liquid separations by processes such as pervaporation.

## References:

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