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Separation of enantiomers by membrane processes

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Abstract

Membrane technologies provide optimal conditions for controlling enantiomer synthesis and purification in continuous production, offering significant advantages over batch manufacturing. One of the key drivers for developing such technologies is the growing demand for enantiomerically pure pharmaceutical drugs, as enantiomers can exhibit opposite therapeutic effects or varying levels of efficacy and side effects. However, despite advancements in asymmetric synthesis and separation techniques, achieving high-purity enantiomers remains a considerable challenge.

This plenary lecture reviews the progress made in membrane-based chiral separation over the past two decades. In addition to describing and critically evaluating the current state of the field, we highlight the advantages and unique characteristics of membranes in enabling the production of enantiomerically pure compounds.

While sorption played a crucial role in pertraction, significantly enhancing the separation of racemic mixtures, pressure-driven membrane processes enabled continuous and accelerated operation [1]. This capability demonstrates the potential for large-scale, continuous production of enantiopure compounds, paving the way for new commercial applications and addressing the increasing need for efficient chiral separation techniques. A detailed comparison with previously reported chiral membranes [2,3] will be discussed at the conclusion of the plenary lecture.

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