



Membranes

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Application of Membrane Materials in Bioseparation and Downstream Processing

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Membrane technologies play an instrumental role in bioseparation and downstream processing. Membrane operations such as microfiltration, ultrafiltration, and virus filtration are key tools for clarification, concentration, buffer exchange, and viral clearance in biomanufacturing, as they offer mild, selective, and efficient separations for delicate biological products. With advances in biotherapeutics development, membrane technologies have become increasingly pivotal in bioseparation and downstream processing. Compared with conventional packed-bed chromatography, a major advantage of membrane technologies is their convective mass transfer, which enables faster processing times and higher productivity. This advantage is particularly crucial for processing increasingly complex and fragile large biomolecules. In this Special Issue, we have collected a diverse yet cohesive set of eight papers on membrane materials in bioseparation and downstream processing, covering applications ranging from conventional clarification and viral clearance to the purification of emerging modalities, including bispecific antibodies, outer-membrane vesicles, viral vectors, and cells. Collectively, these studies demonstrate that membrane technologies have progressed from an auxiliary role to a central, enabling tool in biomanufacturing. We hope that this Special Issue not only provides a timely update on the applications of membrane materials in bioseparation and downstream processing but also serves as a catalyst for continued innovation in membrane technologies.



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