PES-Membrane Meets polyHIPE: A Novel Approach to Separation Technology

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Membrane technology plays a crucial role in various filtration and separation processes, with polyethersulfone (PES) being a widely used material. PES membranes are well-known for their excellent chemical stability and robustness, making them ideal for various filtration processes. However, their relatively low permeability and limited flexibility often restrict their application in more demanding environments.[1] To overcome these challenges, polymerized High Internal Phase Emulsions (polyHIPEs) were used as support material for PES membranes, offering a promising strategy for enhancing their properties. [2,3] PolyHIPEs, engineered using polyurethane diacrylate (PUDA), provide high porosity, structural stability, and tunable mechanical properties, making them suitable for membrane applications. [4] Additionally, the incorporation of silica nanoparticles enabled precise control over pore architecture, leading to optimized polyHIPEs with high permeability, improved mechanical strength, and enhanced resistance to deformation.[5] Rendering them potentially in an ideal membrane support. We will demonstrate that the polyHIPE-supported PES membrane not only enhances mechanical resilience but also opens new possibilities for developing a novel separation system. Therefore, we developed a flow cell which operates under dynamic flow conditions. This flow cell is suited to be integrated into our plant on a bench. For the first time, we will present this new flow cell in which the polyHIPE not only supports the membrane but also acts as a static mixer transporting the filtrate to the membrane. We will provide evidence that our polyHIPE-membrane-filtration-cell is effective for separation under dynamic filtration conditions.

Keywords: PES membrane, polyHIPE, flow separation

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