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New Polyethersulfone (PESU) Hollow Fiber Membranes for CO₂ Capture

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Abstract

Compared to cellulose acetate, silicon rubber, polysulfone, and polyimide, polyethersulfone (PESU) has received much less attention as a commercially viable material for gas separation membranes. This is because PESU has issues of low permeability but rapid physical aging behavior that limit its asymmetric hollow fiber membranes for gas separation applications. To overcome it, a new PESU was synthesized by replacing one diphenyl sulfone unit in the main chains with a bulky and rigid 1,2,4-trimethylbenzene moiety so that the new PESU (referred to as poly trimethyl phenylene ethersulfone (TPESU)) has a greater permeability and less aging behavior. The hollow fiber membranes spun from TPESU dopes exhibit excellent gas separation performance with significantly less aging phenomena. Not only do they have superior O₂ and CO₂ permeance of 16 GPU and 85.1 GPU, respectively, but also possess O₂/N₂, CO₂/N₂ and CO₂/CH₄ selectivity of 6.5, 34.0 and 35.5, respectively at 25 °C. The pure gases are tested at 3.5 atm except CO₂ at 1 atm. The newly developed TPESU hollow fiber membrane has comparable gas separation performance with those fibers spun from Matrimid. The newly designed TPESU

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