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Tuning of Preparational Factors Affecting the Morphological Structure and Gas Separation Property of Asymmetric Polysulfone Membranes

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Abstract: The aim of this work was to study the effect of preparational factors such as solvent type, polymer concentration, evaporation time (ET) and non-solvent additive, on the morphological structure, physical and gas separation properties of the prepared membrane samples by tuning of these parameters. Flat sheet asymmetric polysulfone (PSF) membranes were prepared by the dry/wet phase inversion process incorporated with the double coagulation bath method. The alteration of the prepared membranes were analyzed through the several scientific techniques such as; contact angle, Scanning Electron Microscope (SEM), Fourier Transform Infrared Spectroscopy (FTIR), and Dynamic Mechanical Thermal Analysis (DMTA). Furthermore, gas separation performance of membrane samples was measured in term of gas permeation and ideal selectivity of CO2/CH4. The results showed that the change of preparational factors can affect to the gas permeation of asymmetric PSF membranes. For example, the selective layer thickness increased with increasing of ET and polymer concentration. This lead to increase significantly of ideal selectivity of CO2/CH4. The CO2/CH4 ideal selectivity was also increased with increase of non-solvent additive concentration in casting solution. In summary, the tuning of preparational factors affected to morphological structure and physical and gas separation properties of PSF membranes.

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