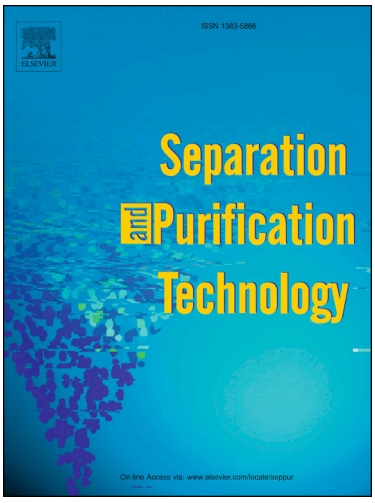

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HIGHLIGHTS

- *Miscible-blend of polymeric PSf/PI membrane for H_2/CO_2 separation*
- *PSf/PI membrane with enhanced H_2 permeation properties*
- *Highly-purified bioH_2 as potential renewable energy*

ABSTRACT

The biogas produced from the anaerobic fermentation of palm oil mill effluent (POME) contains equal amount of H_2 and CO_2, in which the biohydrogen (bioH_2) is a prospective source of renewable energy. Therefore, the determination of an efficient H_2 purification technique has been a major concern. Membrane separation technology is highly recommended due to its excellent purification performance with high permeation of H_2 and H_2/CO_2 selectivity. Polymer blending is a favourable approach due to its simplicity to refine membrane inner structural properties by combining different polymers with complementary features. In this study, the synthesized polysulfone-polyimide (PSf/PI) membrane is an alternative polymeric membrane practicable for H_2/CO_2 separation due to its outstanding permeation properties, enhanced membrane properties as well as improved tolerance to plasticizing gases. The effect of evaporation time on PSf/PI membranes was further investigated and was thoroughly characterized by FTIR, TGA, DSC and FESEM. The miscibility of the PSf/PI blending was proven by DSC with the detection of only single glass transition temperature value. The highest permeability of both H_2 and CO_2 gas were presented by PSf/PI-60 membrane with 348 GPU and 86 GPU, respectively, H_2/CO_2 selectivity of 4.4 and H_2 purification efficiency of 80 %. Hence, PSf/PI membrane is a potential candidate with inherent properties for H_2/CO_2 separation from POME fermentation.

Keywords**:** Biogas; Membrane; Hydrogen; Polyimide; Polysulfone

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