The influence of coating-carbonization cycles toward P84 co-polyimide/nanocrystalline cellulose

Norazlianie Sazali[ab], Wan Norharyati Wan Salleh[c], Nor Hafiza Ismail[c], Ahmad Fauzi Ismail[c], Murakami Hideyuki[d], Yuji Iwamoto[e]

[a]Centre of Excellence for Advanced Research in Fluid Flow (CARIFF), Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300, Gambang, Kuantan, Pahang, Malaysia
[b]Faculty of Mechanical Engineering, Universiti Malaysia Pahang, 26600, Pekan, Pahang, Malaysia
[c]Advanced Membrane Technology Research Centre (AMTEC), School of Chemical and Energy, Faculty of Engineering, Universiti Teknologi Malaysia, 81310, Skudai, Johor Darul Takzim, Malaysia
[d]National Institute for Materials Science (NIMS), Hybrid Materials Center, Coating Materials Group, 1-2-1 Sengen, Tsukuba, 305-0047, Japan
[e]Department of Frontier Materials, Graduate School of Engineering, Nagoya Institute of Technology, Gokiso-cho, Showa-ku, 466-555, Nagoya, Japan

ABSTRACT

Assessment and manufacturing of tubular carbon membrane from P84 co-polyimide (PI) mixtures and nanocrystalline cellulose (NCC) are described in this study. According to the previous work, a hypothesis was formulated stating that manipulation of carbonization parameters can control the performance of a tubular carbon membrane. This study introduces effective dip-coating methods for high-performance tubular carbon membrane production. On the basis of the outcome of this study, the coating-carbonization cycle (one, two, three, or four times) has been recognized as a major influence on the separation efficiency. Gas separation performance, selectivity, permeability, and the transport mechanism of the carbon membranes were adequately evaluated by pure O_2 and N_2. The PI/NCC scanning electron microscopy images show that all of the carbon membrane samples are composed of a dense structure, whereas the Fourier transform infrared spectroscopy analysis exposes that the existence of functional groups is decreased for all coating-carbonization cycle samples. The X-ray diffraction result shows that the membrane carbon structures are amorphous in nature. In this research, the application of two coating-carbonization cycles has resulted in a carbon membrane with the highest selectivity and O_2 permeability, which are 9.29 ± 2.54 and 29.92 ± 2.98 GPU, respectively.

KEYWORDS:

Dip-coating-carbonization cycles; Tubular carbon membrane; Nanocrystalline cellulose (NCC); Oxygen separation; Polyimide precursor; Selectivity

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