

Fabrication and characterization of Novel PolyD-lactic acid nanocomposite membrane for water filtration purpose

ABSTRACT

The development of membrane technology from biopolymer for water filtration has received a great deal of attention from researchers and scientists, owing to the growing awareness of environmental protection. The present investigation is aimed at producing poly(D-lactic acid) (PDLA) membranes, incorporated with nanocrystalline cellulose (NCC) and cellulose nanowhisker (CNW) at different loadings of 1 wt.% (PDNC-I, PDNW-I) and 2 wt.% (PDNC-II, PDNW-II). From morphological characterization, it was evident that the nanocellulose particles induced pore formation within structure of the membrane. Furthermore, the greater surface reactivity of CNW particles facilitates in enhancing the surface wettability of membranes due to increased hydrophilicity. In addition, both thermal and mechanical properties for all nanocellulose filled membranes under investigation demonstrated significant improvement, particularly for PDNW-I-based membranes, which showed improvement in both aspects. The membrane of PDNW-I presented water permeability of 41.92 L/m²h, when applied under a pressure range of 0.1–0.5 MPa. The investigation clearly demonstrates that CNWs-filled PDLA membranes fabricated for this investigation have a very high potential to be utilized for water filtration purpose in the future.

Keyword: Membrane; Nanocellulose; Morphology; Thermal; Tensile; Permeability