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The Influence of Cu-3(BTC)(2) metal organic framework on the permeability and perm-selectivity of PLLA-MOF mixed matrix membranes

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Abstract

Poly(L-lactic acid) (PLLA) - 20% (w/w) and Cu-3(BTC)(2) metal organic framework (MOF) based mixed matrix membranes (MMMs) were fabricated by a vertical corotating twin screw microcompounder followed by an injection molding process. Water vapor, CO₂, O₂, and selected aroma mass transfer properties of PLLA and PLLA MMMs were evaluated. The CO₂/O₂ perm-selectivity of PLLA ((CO₂/O₂)) MMMs increased from 7.6 to 10.3 with the incorporation of 20% Cu-3(BTC)(2) MOF. Gravimetric permeability studies of trans-2-hexenal performed at 23 degrees C and 50% RH indicated that permeability coefficient of PLLA MMMs increased by around 60% as compared to regular PLLA film. However, no changes in mass transfer rates were observed for acetaldehyde. Furthermore, the thermal processing parameters as well as the presence of MOF did not show any significant effect on the molecular weight of the PLLA matrix nor on the crystalline structure of the Cu-3(BTC)(2) MOF, which was confirmed by both gel permeation chromatography and X-ray diffraction studies. (c) 2015 Wiley Periodicals, Inc.

Keywords

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