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Mechanical, thermal and swelling properties of cellulose nanocrystals/PVA nanocomposites membranes

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Cellulose nanocrystals (CNC) have strong reinforcing properties when incorporated in a compatible polymer matrix. The study was conducted to investigate the effect of addition of different proportions of CNC on the mechanical, thermal and swelling properties of poly(Vinyl alcohol) (PVA) nanocomposite membranes for biogas separation. The incorporation of CNC in PVA increased the crystallinity at all investigated relative humidities. No apparent trend is observed for mechanical properties for dry membranes (0% RH) with addition of CNC in PVA matrix. However, at 93% RH the elastic modulus increased 25 times with addition of CNC compared to pure PVA membranes. Moreover, tensile strength also showed twice the values at 53% RH and 93% RH after the addition of CNC. Membranes containing higher CNC content absorbed 9% less moisture. Swelling, thermal and mechanical properties indicate a good potential of CNC/PVA nanocomposite membranes for use in CO_2 separation membranes.

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