

Microgel pintar berstruktur Core-Shell untuk aplikasi Membran Dehumidifikasi: intesa, karakterisasi dan performa = Smart Core-Shell Microgel for Dehumidifying Membrane: synthesis, characterization and performance / Oka Pradipta Arjasa

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Abstrak

High relative humidity of indoor air will tend to increase the risk of health problems. The indoor humidity level can be controlled by using dehumidifying devices. Incorporating nano particle and smart materials into the dehumidifying devices can improve the efficiency and the performance of the devices. The properties of microgels which enable them to undergo such changes under a controlled condition put them into the category of smart materials. Smart materials basically are materials that have one or more properties that can be significantly changed in a controlled fashion by external stimuli, such as stress, temperature, moisture, pH, electric or magnetic fields.

In this study two different core-shell microgels were synthesized and characterized. The performance being a dehumidifying membrane was tested. The parameters affecting the core-shell synthesis were studied and optimized. The crosslinked microgel of poly(N- isopropylacrylamide co methylacrylic acid) (P(NIPAM-co-MAA) was used as shell. Two different cores, P(MMA-co-2-EHA) and silica nanoparticles (SNs) were used.

The synthesis condition for relatively high solids content core-shell microgel suspension of about 15 wt% solids content was optimized. The SNs in this study was synthesized using diethylenetriamine (DETA) as the weak base and resulted in good stability during the synthesis process in aqueous phase. The method used was able to get as high as 10 wt% of solid content of around 100-150 nm SNs with relatively narrow particle size distribution. The SNs produced was then used as the second core.

High crosslink density of polymer core-shell microgels (5 wt% BIS) and SNs inverted core-shell microgel (3 wt% BIS) as dehumidifying membranes have better performance compare to other materials found during the literature search. Relatively high absorption rate, good water uptake and fast regeneration was observed.