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Synthesis and characterization of thin film nanocomposite membranes incorporated with surface functionalized silicon nanoparticles for improved water vapor permeation performance

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13  
14 **Abstract**

15 The present work demonstrates the fabrication of novel thin film nanocomposite membranes  
16 incorporating surface functionalized Silicon nanoparticles (average size 15 – 20 nm) for removal  
17 of water vapor from nitrogen gas. Silicon nanoparticles were synthesized using the inductively  
18 coupled plasma (ICP) technique. The nanoparticles were dispersed in deionized water to  
19 introduce hydroxyl functional groups on the surface. The surface functionalization was  
20 confirmed by infrared spectroscopy. The effect of nano-Si concentration on the water vapor  
21 permeation properties of the TFN membranes was investigated in detail. The hydroxyl functional  
22 groups resulted in significant improvement of surface hydrophilicity and roughness of the  
23 nanocomposite membranes which in turn enhanced the water solubilization. The small size of  
24 nanoparticles permitted extensive interaction between the nanoparticles and the thin film  
25 polyamide layer. Increase in the nano-Si concentration resulted in improvement of water vapor

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