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Mathematical model for polyamide-6/chitosan blend membrane preparation

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The performance of ternary system with one low molecular weight component; formic acid (FA) as solvent, and two high molecular weight polymers; Polyamide-6 (PA-6) and Chitosan (CS) was mathematically investigated. An extended modified Flory-Huggins model was used. The predicted results indicated that the miscibility of PA-6 and CS blend solution was achieved over all used compositions at room temperature. The volume fraction of PA-6 was varied between 0.43-0.022, the Gibbs free energy (Δ Gm) was -3.14 and -4.06 kJ/mole respectively. The predicted results from the critical temperature model for superiority properties of polymer blend solution have shown that the upper critical saturation temperature (UCST) is 323K at a PA-6 volume faction of 0.4 and the lower critical saturation temperature (LCST) is 344K at a Chitosan volume fraction of 0.093. The diffusion model was used to investigate the immersion/precipitation process. The diffusion model has shown that the solvent volume fractions increased with time in the coagulation bath, while the polymer solution volume fraction decreased owing to solvent removal from polymer solution and membrane formation. The ratio of the volume fraction of the volume fraction was increasing gradually due to the release of the solvent from the membrane composite to the coagulation bath.

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