

Preparation of PMMA-PS-silica for natural rubber nanocomposite membranes

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Abstract: Inorganic/organic nanocomposite systems which inorganic particles are encapsulated into the organic polymer are new classes of polymeric materials. This research is to study the preparation of Poly(methylmethacrylate)-polystyrene-silica/natural rubber (PMMA-PS-silica/NR)nanocomposite membranes. Silica nanoparticles was primary modified by silane coupling agent (Vinyltrimethoxysilane, VTS) to enhance the compatibility and dispersion of silica in polymer matrix. PMMA-PS-silica nanoparticles were prepared via differential microemulsion polymerization. The effect of silica loading and surfactant concentration on monomer conversion, particle size, particle size distribution, grafting efficiency and silica encapsulation efficiency were investigated. Their morphology presented silica particle as a core and PMMA-PS as a shell. A high monomer conversion of 99.9% and PMMA-PS-silica nanoparticles with a size range of 30–50 nm was obtained at a low surfactant concentration of 3%wt based on monomers and silica loading of 10%wt based on monomers. Moreover, the physical, mechanical and thermal properties of PMMA-PS-silica/NR nanocomposite membranes were improved. For the pervaporation of water-ethanol mixtures, the flux and selectivity of nanocomposite membranes were reported as a function of PMMA-PS-silica nanoparticles loading. Thus, the PMMA-PS-silica/NR nanocomposite membranes can be used to separate water from mixtures of water/ethanol.

Keywords: Differential microemulsion polymerization, Nanoparticle, Methylmethacrylate, Styrene, Silica

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