

### Nanocomposite films Consisting of Grafting Copolymer and Surface-Modified Silica Nanoparticles

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A graft copolymer of poly(vinyl chloride)-graft-poly(oxyethylene methacrylate) (PVC-g-POEM), was synthesized via atom transfer radical polymerization (ATRP), while fumed silica (SiO<sub>2</sub>) nanoparticles were modified by grafting POEM via a three-step synthetic approach. The resultant graft copolymer and modified SiO<sub>2</sub> nanoparticles were blended to prepare PVC-g-POEM/SiO<sub>2</sub>-POEM nanocomposite membranes. Uniform distribution of SiO<sub>2</sub>-POEM nanoparticles in membranes and microphase-separated morphology were confirmed by transmission electron microscopy (TEM). X-ray diffraction (XRD) analysis revealed increased randomness of the amorphous phase in graft copolymer and continuous decrease in the interchain d-spacing with increased modified-SiO<sub>2</sub> content, indicating a more closely packed nanocomposite membrane structure. The mechanical properties of PVC-g-POEM/SiO<sub>2</sub>-POEM films were superior to that of graft copolymer itself, resulting from strong interfacial interactions in the membranes due to the segregation and entanglement among the POEM chains.