

Templated Synthesis of Silver Nanoparticles in Amphiphilic Poly(vinylidene fluoride-co-chlorotrifluoroethylene) Comb Copolymer

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In this study, poly(vinylidene fluoride-co-chlorotrifluoroethylene)-graft-poly(oxyethylene methacrylate), P(VDF-co-CTFE)-g-POEM, an amphiphilic comb copolymer with hydrophobic P(VDF-co-CTFE) backbone and hydrophilic POEM side chains at 73:27 wt% was synthesized. The POEM side chains were grafted from the P(VDF-co-CTFE) mainchain backbone via atom transfer radical polymerization (ATRP) using direct initiation of the chlorine atoms in CTFE units. Synthesis of microphase-separated P(VDF-co-CTFE)-g-POEM comb copolymer was successful, as confirmed by nuclear magnetic resonance (¹H-NMR), FT-IR spectroscopy, and transmission electron microscopy (TEM). Nanocomposite films were prepared using the comb copolymer as a template film and the in-situ reduction of AgCF₃SO₃ precursor to silver nanoparticles under UV irradiation. Silver nanoparticles with 4–8 nm in average size were in-situ created in the solid state template film, as revealed by TEM, UV-VIS and WAXS. DSC and TGA presented the selective incorporation and the in situ growth of silver nanoparticles within the hydrophilic POEM domains of microphase-separated comb copolymer film.