

Use of Amphiphilic Graft Copolymer Film for the Preparation of Silver Nanoparticles

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Microphase-separated, amphiphilic graft copolymer consisting of a poly(vinyl chloride) (PVC) backbone and poly(oxyethylene methacrylate) (POEM) side chains, PVC-g-POEM was synthesized via atom transfer radical polymerization (ATRP). Nuclear magnetic resonance (^1H NMR), FT-IR spectroscopy and transmission electron microscopy (TEM) clearly revealed that the “grafting from” method using ATRP was successful and the graft copolymer molecularly self-assembled into continuous nanophase domains of PVC and isolated POEM domains. The self-assembled graft copolymer film was used to template the growth of silver nanoparticles at solid state by introducing a AgCF_3SO_3 precursor and a UV irradiation process. The in situ formation of silver nanoparticles in the graft copolymer template film was confirmed by TEM, UV-visible spectroscopy and wide angle X-ray scattering (WAXS). FT-IR spectroscopy and X-ray photoelectron spectroscopy (XPS) also demonstrated the selective incorporation and the in situ formation of silver nanoparticles within the hydrophilic POEM domains, presumably due to strong interaction between the silvers and the ether oxygens of POEM.