Nanocomposites based on SBM triblock copolymer and Ag nanoparticles: morphological and dielectric analysis

I. Barandiaran, X. Velasco-Iza, G. Kortaberria

"Materials + Technologies" Group, Universidad del País Vasco/Euskal Herriko Unibertsitatea, Plaza de Europa 1, 20018 Donostia, Spain
irati.barandiaran@ehu.eus, galder.cortaberria@ehu.eus

Nanocomposites based on polymeric matrix and inorganic nanoparticles present interesting properties, as the addition of inorganic functional nanoparticles endows the nanocomposite with specific advantageous optical, conductive, electric, or magnetic properties [1-3], for different potential applications such as photonic band gap materials, solar cells, sensors, and high-density magnetic storage devices [4, 5], among others. Among metallic nanoparticles, silver (Ag) ones are one of the promising candidates due to their unique optical, electrical and thermal properties and can be incorporated into products that range from photovoltaics to biological and chemical sensors. On the other hand, block copolymers are interesting platform to host those nanoparticles due to its ability to self-assembly into different nanostructures that can be used as templates.

In this work, thin film nanocomposites based on poly(styrene-*b*-butadiene-*b*-methyl methacrylate) (SBM) triblock copolymer and Ag nanoparticles have been prepared (from 0.5 wt% to 15 wt% nanoparticles), after modifying nanoparticles with dodecanothiol in order to improve their dispersion through the block copolymer. Good dispersion of nanoparticles has been obtained for all nanocomposites. Morphological characterization was carried out by atomic force microscopy (AFM), observing morphological changes promoted by nanoparticle addition (Figure 1). On the other hand, conductive properties of nanocomposites were analyzed by dielectric relaxation spectroscopy (DRS), concluding that all nanocomposites were below the percolation threshold.

References

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Figures

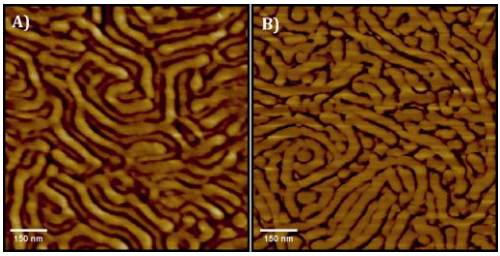

Figure 1: AFM phase images of thin films of (A) SBM and (B) nanocomposite with 5 wt% of Ag nanoparticles