

Maghemite nanoparticles embedded in thin block copolymer films

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Maghemite nanoparticles (NPs) embedded inside a polymer template mark a novel class of hybrid materials which have attracted high interest due to the potential for many applications such as sensors and magnetic storage mediums. The control of the alignment of the maghemite NPs within the polymer NPs is essential for making well-aligned highly-oriented metal oxide-polymer nanocomposites. The alignment of NPs in polystyrene-*b*-poly(N-isopropylacrylamide) P(S-*b*-NIPAM) diblock copolymer (DBC) films is studied. The structure of the resulting films is studied at different concentrations of NPs using SEM, AFM, and GISAXS. The results present a morphological transition from parallel cylinders to perpendicular cylinders with incorporation of NPs into the DBC films. At high NP concentration, large particles aggregates are formed on top of the polymer surface. The magnetic properties of the nanocomposite films at different temperatures are measured and compared with theoretical predictions.

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