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Hierarchical Structuring in Block Copolymer Nanocomposites through Two Phase Separation Processes Operating on Different Time Scales ROY SHENHAR, ELINA PLOSHNIK, AMIT HALEVI, MEIRAV BEN-LULU, Hebrew University of Jerusalem, AXEL H.E. MUELLER, University of Bayreuth, KAROL M. LANGNER, JOHANNES G.E.M. FRAAIJE, G.J. AGUR SEVINK, Leiden University — The ability to assemble nanoparticles (NPs) hierarchically, with control over their positioning and spacing, is considered an important step toward applications where collective properties are sensitive to the morphology of the NP aggregates. Using block copolymers as matrices for organizing metal and semiconductor NPs through microphase separation leads to hierarchical NP assemblies, but control over NP location within the hosting domains is usually limited to one-dimensional distribution. The presentation will demonstrate by both experimental evidence and mesoscopic simulations that functionalizing the nanoparticles with polymeric ligands that are incompatible with both blocks, but to considerably different extents, leads to hexagonally-packed NP assemblies in every other domain of the copolymer film. Such choice of polymeric components leads to a situation where the microphase separation of the block copolymer precedes the macrophase separation of the NPs from the copolymer. Thus, when the latter finally sets in, it occurs within the confines of the domains hosting the NPs. In the hexagonally-packed arrays formed by this process, the interparticle distances are controlled by the thickness of the nanoparticle coating.

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