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Thin Film Composites of Block Copolymers and Bio-Nanoparticles THOMAS RUSSELL, DONGSEOK SHIN, Polymer Science and Engineering, Univ. of Massachusetts Amherst, TING XU, Chemistry, Univ. of Pennsylvania, SEUNG HYUN KIM, Nano-Systems Engineering, Inha Univ. S. Korea, QIAN WANG, Chemistry and Biochemistry, Univ. of South Carolina — Thin film composites of block copolymer and bio-nanoparticle were fabricated through two-step process; adsorption of bio- nanoparticles on polymer film and subsequent annealing under solvent vapor. The humidity of the annealing chamber influenced the dispersion of bio-nanoparticles and the final morphology of the composites. Under high humidity condition, ferritins were dispersed and selectively localized at PEO cylinders of poly (styrene-b-ethylene oxide), P(S-b-EO), while the bio- nanoparticles were aggregated at low humidity. When one component of a block copolymer was charged positively, as in poly(styrene-b-N-methyl-4-vinylpyridinium iodide), P(S-b-4VPQ), the loading of bio-nanoparticles increased significantly. When the loading was low, the morphology was the same as P(S-b-EO) case. However, at high loading, ferritin particles were segregated and formed a continuous boundary around the grains of microphase separated block copolymers. As a result, a 2- dimensional hierarchical structure, where block copolymer chains microphase separated inside of discrete patches surrounded by bio-nanoparticles, was generated. This process was also applicable to anisotropic bio-nanoparticles (e.g. Tobacco Mosaic Virus).

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