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Vertically Aligned Nanoplate Particles Directed by Block Copolymer Domains for Anisotropic Properties NADIA KROOK, University of Pennsylvania, JEFFREY METH, DuPont, CHRISTOPHER MURRAY, ROBERT RIGGLEMAN, RUSSELL COMPOSTO, University of Pennsylvania — During common processing methods, anisotropic fillers in polymer nanocomposites align in the direction of flow, parallel to the surfaces, thus enhancing properties in the plane of the substrate. This research aims to create thin film nanocomposites with perpendicularly aligned anisotropic particles to improve properties in the out-of-plane direction. The demonstrated work explores vertical orientation of rare-earth fluoride nanoplates in lamellar-forming poly(styrene-*b*-methyl methacrylate) to establish a platform that controls the alignment of any planar particle. Currently, gadolinium fluoride (GdF_3) rhombus nanoplates with the longest and shortest diagonal dimensions of ˜30 nm and ˜25 nm, respectively, have been specially synthesized with the potential to intercalate the block copolymer (BCP) domains. By employing a ternary brush blend layer to neutralize silicon substrates to both BCP domains, vertical lamellae orientation has been enabled with an optimum film thickness of ˜110 nm. The GdF_3 surfaces are chemically modified to drive the plates to a specific BCP domain. After surface modification, the dispersion of GdF_3 in homopolymer will first be shown followed by morphology results from integrating GdF_3 into the BCP using scanning and transmission electron microscopy.

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