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**Directed Self-Assembly of Lamellar Block Copolymers for High Energy Density Capacitors** ALAMGIR KARIM, Univ of Akron, SAUMIL SAMANT, Intel Corporation, CHRISTOPHER GRABOWSKI, MICHAEL DURSTOCK, Air Force Research Laboratory, SUSHIL SATIJA, National Institute of Standards and Technology — Energy storage is a fundamental issue driving the development of new materials and their associated fabrication. We report the development of high energy density solid-state capacitors fabricated using multicomponent block copolymer dielectric films (BCDF) with soft-shear driven highly oriented self-assembled lamellar diblock copolymers (BCP). Results of a model polystyrene-b-polymethyl methacrylate system processed by a unique Cold Zone Annealing-soft shear method show approximately 50% enhancement in the dielectric breakdown performance of self-assembled multilayer lamellar BCP films compared to unordered as-cast films, indicating that the breakdown is highly sensitive to the nanostructure of the BCP. We also report the effect of molecular weight (MW) and layer thickness on dielectric properties of self-assembled BCPs by studying ternary blends of BCP/homopolymers with compositions such that the homopolymers selectively segregate into respective BCP domains. The blend compositions help to decouple the effects of MW and layer thickness demonstrating that the polymer chain ends act as defect sites by contributing to the free volume in the system that are responsible for the breakdown of BCDF.

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