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Effect of Polymer Blocking Layer and Processing Method on the Breakdown Strength and the Extractable Energy Density of Barium Titanate/poly(vinylidene fluoride-co-hexafluoropropylene) Nanocomposite Thin Film Capacitors YUNSANG KIM, MOHANALINGAM KATHAPERUMAL, O'NEIL SMITH, Georgia Tech, MING-JEN PAN, Naval Research Laboratory, JOSEPH PERRY, Georgia Tech — Polymer-metal oxide nanocomposites are of great interest because of their high energy density and easy processability, which make them candidate materials for energy storage applications. Although loading of high-k filler in polymer matrix is desirable to maximize energy density of nanocomposites, the decrease of breakdown strength at higher loading compromises a potential gain in energy density. In this work, we investigate the effect of a fluoropolymer (CYTOP) blocking layer in $BaTiO_3$/poly(vinylidene fluoride-co-hexafluoro propylene) nanocomposite films on the improvement of breakdown strength and energy storage density. The introduction of blocking layer may serve to prevent moisture absorption and charge injection from electrode, thereby decreasing the probability of catastrophic breakdown events. We also examine the influence of processing method, i.e. spin- or blade-casting, on the performance of bilayer films. The charge-discharge method shows about a twofold increase in extractable energy density (from 2 to 3.7 J/cm^3) of bilayer films fabricated by blade-casting compared to single layer film by spin-casting because of improved breakdown strength. The results will be discussed in regards to morphology, electric field distribution, and loss of bilayer films.

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