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High Electric Energy Storage in a Three-Phase Polymer Nanocomposite¹ JING WANG, FANGXIAO GUAN, LEI ZHU, Polym. Program, Inst. of Mater. Sci. and Dept. of Chem., Mater. and Biomolecular Eng., University of Connecticut, Storrs, CT 06269-3136 — Two-phase polymer/ferroelectric ceramic composites have attracted great interests for electric applications, such as transducers, piezo-sensors, and hydrophone materials, because they combine good processability of polymers and high dielectric constant of ferroelectric ceramics together. The polymer-ceramic composites generally show a high effective dielectric constant only at a high ceramic volume fraction (>35 vol.%). Here, a high dielectric constant tetrameric Cu-phthalocyanine (Cu-TMPc) was used as an interfacial phase between the ceramic particles (50-nm BaTiO₃) and the polymer matrix [poly(vinylidene fluoride-co-hexafluoropropylene), or P(VDF-HFP)]. To avoid the agglomeration of nanoparticles in P(VDF-HFP), poly(methyl methacrylate) is grafted from Cu-TMPc-coated BaTiO₃ nanoparticles using surface-initiated radical polymerization. High electric energy storage and low conductivity were achieved at low filling ratios (<15 vol.%).

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