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BaTiO3 and polypropylene nanocomposites for capacitor applications DAXUAN DONG, LONGXIANG TANG, LEI ZHU, Case Western Reserve Unviersity, JE KYUN LEE, Agiltron, Inc, CASE WESTERN RESERVE UNIVERSITY COLLABORATION, AGILTRON, INC COLLABORATION — A novel strategy to uniformly disperse 70-nm BaTiO3 ferroelectric nanoparticles in a dielectric polypropylene (PP) matrix is developed in order to achieve high dielectric constant and high energy density for capacitor applications. By modifying BaTiO3 surface with a bis-phosphonic acid-terminated polyhedral oligomeric selsisquioxane (POSS), a nanocomposite with BaTiO3@POSS uniformly dispersed in PP matrix was achieved. The nanocomposite film containing a high nanoparticle content of 30 vol.% exhibited a high dielectric constant of 32 and a breakdown voltage of 220 MV/m, but with a high energy loss. Improvement of this nanocomposite by understanding the interfacial polarization is carried out in this work. The dielectric constant difference between BaTiO3 and PP can generate interfacial polarization and subsequent internal conduction in BaTiO3 particles upon bipolar polarization. Reduction of this internal conduction mechanism will significantly reduce the hysteresis loss in polymer nanodielectrics.

Daxuan Dong
Case Western Reserve Unviersity

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