

Abstract Submitted  
for the MAR17 Meeting of  
The American Physical Society

**Achieving dielectric enhancement in dipolar polymer blends: free volume increase while maintaining low loss** BING ZHANG, NC State University, YASH THAKUR, Penn State University, RUI DONG, WENCHANG LU, NC State University, CIPRIAN IACOB, JAMES RUNT, QIMING ZHANG, Penn State University, JERRY BERNHOLC, NC State University — High dielectric constant and low loss are the key performance parameters for polymer dielectrics. We consider strongly dipolar polymers, such as PEEU and ArPTU, which have relatively high dielectric constants, high thermal stabilities and low loss. We show through both molecular dynamics simulations and experimental measurements that a nanostructured blend of these polymers results in a much enhanced dielectric constant while maintaining low loss. The blends have lower densities compared to the pure polymers, due to different chain periodicities and dipole mismatches, which lead to the formation of a glassy structure with slightly increased average interchain spacing. The increased free volume reduces barriers to dipole rearrangement along the applied electric field, thereby enhancing the dielectric response without increasing loss.

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Date submitted: 10 Nov 2016

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