

Abstract Submitted
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Sulfone-Containing Dipolar Glass Polymers with High Dielectric Constant and Low Loss Property¹ YUFENG ZHU, ZHONGBO ZHANG, MORTON LITT, LEI ZHU, Department of Macromolecular Science and Engineering, Case Western Reserve University, Cleveland, Ohio 44106 — Sulfone-containing polyoxetanes are designed and synthesized for high dielectric constant and low loss dipolar glasses. The precursor polymer, poly(3,3-bis(chloromethyl)oxetane) (PBCMO) is synthesized by bulk cationic polymerization with boron trifluoride diethyl etherate as initiator. The number-average molecular weight of PBCMO is 73 kDa, with a polydispersity of 1.53 as obtained from size-exclusion chromatography results. Post-modification of PBCMO yields the dipolar glass polymer, poly(3,3-bis(methylsulfonylmethyl)oxetane) (MST). Nuclear magnetic resonance result shows 100% conversion. Differential scanning calorimetry result indicates that MST has a glass transition temperature of ca. 120 C. Due to the large dipole moment (4.25 D) and small size of the side-chain sulfone groups, MST exhibits a high dielectric constant of 8.7 and a low dissipation factor of 0.01 at 25 C and 1 Hz. This study suggests that dipolar glass polymers with large dipole moments and small-sized dipoles in the side chains are promising candidates for high energy density and low loss dielectric applications.

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