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**Aromatic Polythiourea Dielectrics with High Energy Density, High Breakdown Strength, and Low Dielectric Loss** SHAN WU, QUINN BURLINGAME, MINREN LIN, QIMING ZHANG, The Pennsylvania State University — There is an increasing demand on dielectric materials with high electric energy density and low loss for a broad range of applications in modern electronics and electrical power systems such as hybrid electric vehicles (HEV), medical defibrillators, filters, and switched-mode power supplies. One major challenge in developing dielectric polymers is how to achieve high energy density  $U_e$  while maintaining low dielectric loss, even at very high-applied electric fields. Here we show that amorphous polar-polymers with very low impurity concentration can be promising for realizing such a dielectric polymer. Polar-polymer with high dipole moment and weak dipole coupling can provide relatively high dielectric constant for high  $U_e$ , eliminate polarization and conduction losses due to weak dipolar coupling and strong polar-scattering to charge carriers. Indeed, an aromatic polythiourea thin film can maintain low loss to high fields ( $>1$  GV/m) with a high  $U_e$  ( $\sim 24$  J/cm<sup>3</sup>), which is very attractive for energy storage capacitors.

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