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Shock Wave Energy Dissipation using Polymerized Ionic Liquids JAEJUN LEE, Dept., of Mat., Sci., and Eng., Univ., of Illinois at Urbana-Champaign, YI REN, Dept., of Chemistry, Univ., of Illinois at Urbana-Champaign, CHRISTOPHER EVANS, Dept., of Mat., Sci., and Eng., Univ., of Illinois at Urbana-Champaign, JEFFREY MOORE, Dept., of Chemistry, Univ., of Illinois at Urbana-Champaign, NANCY SOTTOS, Dept., of Mat., Sci., and Eng., Univ., of Illinois at Urbana-Champaign — Polymerized ionic liquids composed of alkyl-imidazolium cations and bis(trifluoromethane)sulfonamide anions exhibit intriguing shock wave energy absorption performance. In prior work, we observed a shock-induced disorder-to-order change in network forming ionic liquids. We hypothesize that this shock-induced ordering is strongly associated with the microstructure of the ionic liquids. Polymerized ionic liquids, which have similar microstructures but slower relaxation times compared to the ionic liquids, are prepared to demonstrate the ordering transition mechanism and to exploit relaxation processes for the energy dissipation. By employing size-tunable alkyl backbone spacers between cations, we explore the effect of the relative microstructural heterogeneity on the activation of shock-induced ordering. Relaxation time, which is adjustable by the alkyl spacer length, also plays an important role in the energy dissipation process. Absorption properties of a series of thin film (ca. 50 μm) polymerized ionic liquids are evaluated using a laser-induced shock wave testing protocol. Superior shock wave mitigating performance of polymerized ionic liquids was achieved compared to polyurea films.

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