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Thermal and Mechanical Properties of Sequential and Simultaneous Thiol-Ene-Isocyanate Networks OLIVIA MCNAIR, DAVIS BRENT, DANIEL SAVIN, School of Polymers and High Performance Materials, University of Southern Mississippi — Ternary networks containing having stoichiometrically balanced thiol /(ene+isocyanate) ranging from 0 to 20 molsynthesized via sequential or simultaneous thiol/ene and thiol/isocyanate click reactions. The effects of cross-link density were studied using three thiols, GDMP (difunctional), 3T (trifunctional) and 4T (tetrafunctional) respectively. TEA catalyzes the isocyanate-thiol coupling and chain extension, while the photoinitiator DMPA initiates a radical thiol-ene crosslinking process. Real-time FTIR was used to study kinetics of both light and dark reactions utilizing thiol, ene and isocyanate peaks which appear independently. It was found that difunctional thiols and isocyanates reacted initially, forming chain extended prepolymers end-capped with thiol functionalities. Upon UV irradiation, thiol functionalized prepolymers reacted with TTT, a trifunctional ene, forming networks containing incorporated thiourethane linkages. Initial DSC results indicated higher Tgs for higher cross-linked networks; however, isocyanate content has significant effects on each system. Films were also be thermally characterized via DMA and mechanical properties measured using MTS.

Daniel Savin

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