Bio-inspired energy dispersive materials: Modifications and mechanical testing of a thiol-ene system


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Summary: Two thiol-ene based materials are being studied for energy dispersive purposes. The first employs metal ion complexation mechanism that is originally found in biological systems. The second thiol-ene material is functionalized on its surface to improve the interface interactions between a thiol-ene/polyurethane foam system.

Inspired by examples in nature, we aim to develop, characterize, and understand new materials for force protection. The system of present interest combines a periodic polymer lattice based on thiol-ene “click” chemistry [1] with a stochastic polyurethane foam, yielding a hierarchical composite. The two systems interact at the interface through a thiol-isocyanate “click” reaction [2]. By functionalizing the surface of the thiol-ene network, we plan to study the interface interactions between the thiol-ene network and the polyurethane foam, as these interactions could be vital in determining the bulk properties of the composite. In addition, we are making our own thiol-ene networks to make new materials that mimic the metal ion cross-linking mechanism found in the ragworm jaw through the integration of chelating groups and metal ions. By taking advantage of the efficient and robust thiol-ene click chemistry, we expect to achieve an improvement in mechanical properties [3]. Findings from this study will inform the future design of composite materials for blast mitigation.

References: