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ADDITIVELY MANUFACTURED MULTIFUNCTIONAL BIO-BASED COMPOSITES

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The development of new materials solutions for advanced manufacturing and fabrication technologies is an increasing focus of many research and development efforts in applied materials science today. Advances in these areas are resulting in the development of novel, geometrically complex parts and functional devices in a multitude of arenas, such as the biomedical and aerospace industries. Recent progress in materials research includes; the development of polymer systems that are less reliant on petroleum-based products, and are instead based on renewable, bio-derived sources. Concurrently, new *additive* manufacturing (AM) technologies are allowing the production of complex parts with structures and physical response not typically achievable through conventional manufacturing means. AM has become a leader in manufacturing complex and previously difficult to fabricate structures with fine features, by employing three-dimensional printing methods such as direct ink write (DIW) and stereolithography (SL). Our materials based approach has been to develop tailored and functional polymer based feedstocks for such AM processes to expand the range of these versatile fabrication technologies and explore new design space for AM. Here we present stimuli responsive, tailorable and robust class of, printable bio-based polymer composite that has been three dimensionally printed via additive manufacturing methods to have micro and macro scale complexity in features and exhibit a strong, tunable shape memory response. The development, characterization and potential applications of these novel shape memory polymer composite AM structures will be discussed.

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