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Article

## Tough, stable spiroacetal thiol-ene resin for 3D printing

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### ABSTRACT

Though over 30 years old, 3D printing has seen an explosion of interest in recent years as technology has become sufficiently advanced and affordable, enabling widespread usage, and investigation of the technique as a method of manufacture. However, the materials commonly used for printing applications frequently suffer from poor mechanical properties and are only suitable for prototyping and non-load-bearing objects. We report a stable, tough resin formulation which incorporates spiroacetal molecules into the polymer backbone and displays widely varying and tunable mechanical properties. We characterize the system via (photo-)DSC, rheology, and tensile testing; further, we detail a comprehensive heat treatment investigation to optimize material performance and elucidate the structure–property relationships present in the printed and non-printed semi-crystalline photopolymer. Annealing the material at 40 °C for 120 hours produced a tough thiol-ene with a homogenous crystal structure. Printed samples exhibited comparable morphology their cast analogues, but suffered from reduced tensile properties as a result of interlayer adhesion. © 2018 Wiley Periodicals, Inc. *J. Appl. Polym. Sci.* **2018**, 135, 46259.

### Supporting Information

Additional Supporting Information may be found in the online version of this article.