

CURE BEHAVIOR AND THERMO-MECHANICAL PROPERTIES OF DUAL-CURE THERMOSET RESINS CONTAINING FUNCTIONALIZED FILLERS

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Key words: Dual-cure, direct ink write, functionalized fillers, rheology, mechanical properties

Thermoset polymers are of interest for many structural applications due to their mechanical, thermal, and chemical resiliency in comparison to thermoplastic polymers. Dual-cure resins are comprised of multiple thermoset polymers that are cured using different stimuli or variations of the same stimuli (i.e. temperatures, wavelengths, etc.). Sequential curing of the resin, via UV exposure followed by thermal exposure, creates interpenetrating polymer networks which enhance the overall mechanical properties compared to either parent material. The addition of inorganic fillers alters the rheology and printability of the resin in addition to improving mechanical properties. When these fillers are functionalized with epoxy and/or acrylate groups, we hypothesize that they will not only further improve the mechanical properties, but also aid in each individual network formation. This research describes the influence of different filler materials and filler surface functionalization on the cure behavior and thermomechanical properties of a UV/thermal acrylate-epoxy dual-cure system for use in direct ink write additive manufacturing.

SNL is managed and operated by NTESS under DOE NNSA contract DE-NA0003525