Epoxy Resin Formulation for 3D Printing by Liquid Crystal Display (LCD)

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In the Additive Manufacturing (AM) landscape, resin photopolymerization printing is showing great results in terms of engineering applications [1-3]. There are several techniques and materials used. In the present work, the VAT polymerization process has been studied, in particular the Liquid Crystal Display (LCD) printing.

Following the investigation of previous works [4], new epoxy resin-based blends have been studied, with the aim of improving the printability of the resin without compromising the thermomechanical properties of the printed part.

Different mixtures have been formulated and studied depending on the percentage of diluent, to observe the impact that the addition of epoxy resin has on the commercial resin. In particular, Diglycidyl ether of bisphenol A (DGEBA) mixed with Diethyltoluene Diamine (DETDA) was added due to the easy processing in liquid form at room temperature. Thermomechanical analyzes were carried out on the resulting mixtures.

The best printing conditions were assessed with various speed cure tests (SCT). The characterization of the epoxy-resin blends for knowing the exposure times was carried out by using the statistical methodology of the Design of Experiments (DoE).

The heat treatment was optimized from 4.5 to 3 hours, printed parts having a glass transition temperature (*T*g) equal to 114 °C were obtained and the exposure time was decreased from 30 to 15 s.

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