Optimization of SLA Photopolymers for Nickel Plating Applications

by

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ABSTRACT

Applications in the aerospace and defense industries are demanding stronger and lighter parts for use in aircraft and spacecraft. Additive manufacturing (AM) has allowed engineers to create complex parts that would be difficult or even impossible to create through standard manufacturing methods. Stereolithography (SLA) additive manufacturing offers an easy and affordable way to create extremely complex and detailed geometries by selectively curing thin layers of a photopolymer resin. To increase part performance, a nickel coating can then be applied in order to increase strength, chemical resistance, and heat deflection. This works well in lab environments, but in harsh conditions such as those presented in aerospace applications, large thermal gradients cause the nickel and resin to expand at different rates. This causes high internal stresses and can even result in part failure. The development of a strong, reliable resin that would match coefficient of thermal expansion as that of nickel could fill a gap in additive manufacturing between fully plastic or metal parts, allowing for low cost production of high-performance parts. In this paper we will cover the development of an SLA resin with good mechanical properties and a thermal expansion rate similar nickel for aerospace applications.