

PHOTOPOLYMERIZATION OF SUSPENSIONS FOR DIRECT DIGITAL MANUFACTURING OF CERAMICS

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Ceramics can be manufactured directly from digital files using photopolymerization of concentrated colloidal ceramic suspensions. I will discuss the recent progress in understanding suspension polymerization as influenced by photon scattering and absorption, and manipulation of free radical polymerization. I will discuss ceramic “Direct Digital Manufacturing” methods based on suspension photopolymerization, using both commercial stereolithography machines and also the new method of Large Area Maskless Photopolymerization (LAMP). LAMP is a layered manufacturing method where 100-micron layers of liquid ceramic suspension are patterned by photopolymerization. Complex macroscopic objects are built from hundreds of layers. After the build, uncured suspension is removed produce a ceramic green body and the ceramic is finished by binder removal and sintering. The target application is investment casting molds for superalloy turbine airfoils. I will present the current status for of refractory silica investment casting molds, and single crystal nickel superalloys cast in LAMP-build molds.