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Monomer Chain Length Effects on DLP Ceramic Printing and Sintering

Vat photopolymerization based additive manufacturing enables the fabrication of complex ceramic components, but the final performance of printed parts is largely determined by debinding and sintering rather than by the printing step. In practice, low molecular weight acrylates are commonly used to obtain the rheology required for high ceramic loadings, yet understanding how binder chemistry affects green body behavior and thermal decomposition remains essential. Ethoxylated acrylates provide a controlled way to vary binder structure, as the same acrylate chemistry is explored while only the chain length is changed.
In this work, alumina slurries were formulated using ethoxylated acrylate binders with different degrees of ethoxylation. All formulations showed strong photopolymerization under blue light exposure (460 nm), while rheology, green part flexibility, and build plate adhesion varied with molecular weight, with longer chains improving handling.
Thermal analysis showed that increasing ethoxylation widens the temperature window of organic burnout, giving more gradual mass loss during debinding. Sintered density decreased with increasing ethoxylation, while higher densities were obtained for the lower ethoxylation monomers.
These results show that varying molecular weight within a single ethoxylated acrylate system provides a practical way to increase printability and green body properties, but at a cost of lower sintered density.

Professional Status of the Speaker

Doctoral or Master Student

Interest in submitting a paper in a special issue of

No interest

Invitation letter for visa

No

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