NATURAL-BASED PHOTOCURABLE FUNCTIONAL MATERIALS FOR DIGITAL LIGHT PROCESSING

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The increasing demand for additive manufacturing, particularly digital light processing (DLP) printing, has raised concerns regarding its environmental impact. Conventional materials used in DLP printing, such as petroleum-based resins, often pose challenges in terms of sustainability, resource depletion, and waste generation. To address these issues, it is required to explore sustainable alternatives derived from natural sources[1].

Natural polymers have gained significant attention for printable ink development due to their availability, low cost, biodegradability, and compatibility with various printing techniques. The formulation of natural polymer-based inks involves careful consideration of their rheological properties, stability, and printability, while maintaining biocompatibility and environmental sustainability[2]. This work highlights the key factors influencing ink development, including material selection, ink formulation, and process parameters optimization, to achieve reliable and high-quality 3D printed objects. Thus, different reactive diluents have been tested in soybean oil-based inks to optimize viscosity to allow a DLP printable formulation. The photopolymerization process of the obtained materials is comparable with the one of commercially available resins, while maintaining high biorenewable carbon content and presenting high quality in printing parts.

Further, the incorporation of fillers into natural polymer-based inks has opened up new possibilities for functionalizing printed objects[3]. Along this work, different functional materials including thermochromic ionic liquids, conductive particles or photoluminescent salts have been successfully incorporated in soybean-oil based polymers. The influence of filler content in the UV curing process, ink viscosity, thermo-mechanical properties and functional response have been investigated. This work sheds light on the advancements in natural polymer-based inks for additive manufacturing, specifically targeting DLP technology, and emphasizes the potential of integrating fillers to expand the functional capabilities of 3D printed objects. The findings presented in this abstract contribute to the broader understanding of materials development for additive manufacturing.

References

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