DESIGN OF BIOBASED UV CURABLE FORMULATIONS FOR 3D PRINTING

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Over the past few decades, the development of polymeric materials derived from bio-renewable sources has grown significantly, driven by the environmental challenges that the planet is facing. Moreover, the depletion of oil, which is the primary carbon resource for polymer synthesis, has stimulated in-depth research into alternative sources that have a reduced environmental impact. Indeed, most resins processable through VAT polymerization techniques are obtained from fossil sources. An interesting green alternative is represented by vegetable oils (VO), which can be easily functionalized thanks to the presence of numerous insaturations and their high availability at low cost. Among these, soybean oil is one of the most used thanks to the possibility of being functionalized through epoxidation and subsequent acrylation to obtain acrylated epoxidized soybean oil (AESO). Besides VO there are other possibilities, like glycerol-based polymers, which can be acrylated to make them sensitive to UV light. In this work, different types of formulations based on AESO [1] and polyglycerol-based acrylic monomers [2] (by Sakamoto Yakuhin Kogyo Co., Ltd.) were characterized and tested as feed materials for digital light processing (DLP). Reactivity, rheological properties, and visco-elastic properties of these two kinds of formulations have been investigated. Additionally, complex shaped objects were printed to determine the accuracy of the printing process with these formulations.

References

1. M. Porcarello, C. Mendes-Felipe, Senentxu Lanceros-Mendez, M. Sangermano, 2023, (paper submitted).
2. M. Porcarello et al., (paper in preparation).