

# **3D printing of a graphene-modified photopolymer using stereolithography for biomedical applications: a study of the polymerization reaction**

S. López de Armentia Hernández; S. Fernández Villamarín; Y. Ballesteros Iglesias; J.C. Real Romero; N. Dunne; E. Paz Jiménez

## **Abstract-**

Additive manufacturing is gaining importance thanks to its multiple advantages. Stereolithography (SLA) shows the highest accuracy and the lowest anisotropy, which has facilitated the emergence of new applications as dentistry or tissue engineering. However, the availability of commercial photopolymers is still limited, and there is an increasing interest in developing resins with properties adapted for these new applications. The addition of graphene-based nanomaterials (GBN) may provide interesting advantages, such as improved mechanical properties and bioactivity. However, there is a lack of knowledge regarding the effect of GBNs on the polymerization reaction. A photopolymerizable acrylic resin has been used, and the effect of the addition of 0.1wt% of graphene (G); graphene oxide (GO) and graphite nanoplatelets (GoxNP) on printability and polymerization have been investigated. It was observed that the effect depended on GBN type, functionalization and structure (e.g., number of layers, size, and morphology) due to differences in the extent of dispersion and light absorbance. The obtained results showed that GO and GoxNP did not significantly affect the printability and quality of the final structure, whilst the application of G exhibited a negative effect in terms of printability due to a reduction in the polymerization degree. GO and GoxNP-loaded resins showed a great potential to be used for manufacturing structures by SLA.

**Index Terms-** Nanocomposites, Graphene-based nanomaterials, Stereolithography, Photocurable polymer, Printing accuracy

Due to copyright restriction we cannot distribute this content on the web. However, clicking on the next link, authors will be able to distribute to you the full version of the paper:

[Request full paper to the authors](#)

If your institution has an electronic subscription to International Journal of Bioprinting, you can download the paper from the journal website:

[Access to the Journal website](#)

**Citation:**

*López de Armentia, S.; Fernández-Villamarín, S.; Ballesteros, Y.; del Real-Romero, J.C.; Dunne, N.; Paz, E. "3D printing of a graphene-modified photopolymer using stereolithography for biomedical applications: a study of the polymerization reaction", International Journal of Bioprinting, vol.8, no.1, pp.503-182-503-197, March, 2022.*