

## **Title: Durability and Performance of Photocurable Acrylic Resins in Long-Term Biomedical 3D Printing Applications**

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The field of biomedical 3D printing has seen significant advancements with the introduction of biocompatible photocurable acrylic resins. Traditionally, these resins have been confined to short-term biomedical contact due to limited data on long-term biocompatibility. This study explores the long-term viability of these materials for prolonged biomedical use, especially under conditions that mimic the human body environment.

This research involved an extensive analysis of the mechanical behavior of a commercial resin, Biomed Clear from Formlabs, under static conditions (compression and flexion) over varying aging periods. A critical aspect of this research involves simulating in vitro conditions by immersing the resins in Phosphate Buffered Saline (PBS) at 37°C, thus replicating the human body environment.

Furthermore, considering the potential application of these resins in fabricating bone scaffolds or artificial grafts, porous structures have been also manufactured and evaluated their fatigue behavior, both pre- and post-in-vitro aging. This aspect of the study is particularly groundbreaking as it offers a closer approximation to the material's real-life performance within the human body.

The results highlight a significant understanding of the properties of these materials over extended periods, opening avenues for their application in new biomedical areas. Notably, all samples were produced using 3D printing technology, marking this study as one of the first to provide comprehensive long-term mechanical data under simulated in-vitro conditions.

This research not only contributes to the field of materials science but also holds immense potential in revolutionizing the application of 3D printed materials in long-term biomedical solutions.