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Abstract

Selection of Conventional Photoinitiators to Produce Biocompatible UV Epoxidized Soybean Oil Resin Mixtures for 3D Printing Technology †

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Abstract: The use of natural-based resins as matrices for 3D printing is currently an expanding area with a considerable potential to explore. These materials, in addition to presenting high biocompatibility, come from renewable natural resources, causing them to be very attractive in terms of cost and environmental benefits. In the production of objects using photopolymerization, natural-based resins can be used with photoinitiators, causing them to be amenable to UV-curing. Thus, the choice of natural resins, photoinitiators, and light sources, which allow for proposing new formulations, with the biocompatibility properties of the natural material, and can compete with those available on the market, justify research in this area. Within this context, five conventional photoinitiators, namely benzophenone, 2,2-dimethoxy-2-phenylacetophenone, ethylphenyl (2,4,6-trimetylbenzoyl) phosphinate, 2-chlorothioxannthen-9-one, and 2-isopropylthioxanthone, were tested and evaluated to promote UV curing a natural resin derived from epoxidized soybean oil. Different mixtures were prepared, with 1 to 0.01% of photoinitiators (*w*/*w*, initial resin basis) and operational parameters, such as time and wave-length source, were tested. Cured mixtures were evaluated concerning their physicochemical structures and mechanical and biological properties. The results showed that, of the five photoinitiators studied, the most suitable to produce epoxidized soybean oil resin mixtures for 3D printing was ethylphenyl (2,4,6-trimetylbenzoyl) phosphinate. With its use, even in reduced amounts 0.01% (*w*/*w*), it was possible to produce transparent films and print pieces using stereolithography, with greater thickness, than those displayed by similar pieces prepared from mixtures of the same resin with other photoinitiators. The mechanical properties were similar to those obtained for the pieces produced with a commercial resin, which was used as a reference, and no antibacterial activity was evidenced against Escherichia coli and Staphylococcus aureus by these new materials.

Keywords: 3D printing; biocompatible mixtures; soybean resin; photoinitiators; UV curing

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