

The main objective behind the project is to develop new highly effective, one-component photoinitiators, based on naturally occurring compounds such as citric acid, dedicated for mostly free-radical photopolymerization processes. The proposed structures are predicted to be useful in light-based 3D printing technologies that will lead to obtaining complex three-dimensional structures using safe components.

Due to the growing search for the natural alternatives in various fields connected to chemistry, biology, materials science, biotechnology and others, the research on the use of naturally occurring compounds and their potential use as components of light-cured compositions is gaining importance. The following project is aimed at widening the research concerning the issue. The most crucial issues involved within this project will be concentrated on:

- ✓ **Reducing the environmental impact** caused by the use of synthetic substrates by utilizing mostly naturally occurring compounds for the synthesis as well as possibly changing the monomer or oligomers in order to obtain fully bio-based formulations. One of the key subjects in the recent years have become the substitution of the synthetic materials with the natural alternatives which cause less harm to the environment and living organisms. The proposed structures are predicted to display less cytotoxicity and genotoxicity making them a safe alternative.
- ✓ **Providing better spectroscopic properties** of the obtained photoinitiators. Due to the growing research interest concerning 3D printing and its applications there is a need for the high-efficient photoinitiating systems that will provide an opportunity to obtain high-resolution three-dimensional structures. As most of the commercially available 3D printers consist of the light source emitting light ranging around 405 nm, the absorption properties of the initiating system must correspond to the said irradiation range. This proposal provides the opportunity to obtain compounds that are characterized by absorption spectra reaching up to the visible range making them suitable for the use in 3D printing processes.
- ✓ **Enhancing the effectiveness** of the initiation process. There are only a few groups of photoinitiators that are highly-efficient, while most of them need an additional component and even then the quality of the system as well as the resulting materials leaves much to be desired. The main objective of the project is to develop different types of photoinitiators with enhanced efficiency that will allow for the fabrication of complex structures using 3D printing methods.



Figure 1. An overview of the research and the issues concerning the subject of the project.

The proposed research will provide a way to fill a research gap on the issue of using bio-based photoinitiating systems for light-induced polymerization processes. The main goal of the project is to develop new bio-based photoinitiating systems that would be applicable in 3D printing processes using both synthetic and naturally derived monomers or oligomers for the obtaining of safe, efficient and environmentally friendly photoinitiating systems. This research will widen the knowledge about the possible use of new naturally derived compounds for the use in photoinitiating systems dedicated for light-induced polymerization processes, as well as their use in light-cured resins for manufacturing of polymeric materials characterized by high-resolution of the complex structures using 3D printing methods.