# Synthesis and UV cross-linking of methacrylated linear and star-shaped lactide oligomers as potential biodegradable resins for stereolitography

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**Abstract.**
Stereolitography and DLP printing attract a lot of attention in medical field as techniques for fabrication of personalized implants. However, there is a limited choice of biocompatible photo-curable resins, especially for fabrication of biodegradable devices. In this work we present biodegradable UV-curable D,L-lactide oligomers, which can be good candidates as resins for stereolitography. For biomedical applications of cross-linked polymer networks it is important to control their properties and degradation kinetics, which depend on molecular characteristics of initial oligomers. Therefore, the goal of the present research was synthesis and investigation of cross-linking of methacrylated D,L-lactide oligomers with different molecular weight and architecture.

Linear and star-shaped (3- and 6-arm) oligomers with different arm lengths were synthesized by ring-opening polymerization of D,L-lactide in presence of activators with different number of OH-groups: ethylene glycol, trimethylolpropane and dipentaerythritol. Kinetics of these reactions was studied in order to achieve high degree of conversion and predetermined molecular characteristics. Functionalized cross-linkable resins were obtained by modification of hydroxyl end-groups of oligomers with methacrylic acid derivative. UV-curing of functionalized oligomers was performed in presence of photoinitiator and revealed the formation of gel fraction, which achieved 99 %. Some oligomers demonstrated rather low viscosity (about 10 Pa·s), suggesting that they are suitable for stereolitography applications. The research was supported by President's grant for young scientists (project MK-5517.2021.1.3).