Cyclic acetals as photopolymerizable precursors for degradable biomaterials

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Aging societies combined with the growing trend of minimally invasive surgeries increase the demand for medicinal graft materials applicable for tissue engineering (TE) [1]. Most materials currently used in TE are based on ester polymer backbones *e.g.* poly(hydroxy acids) like poly(ε-caprolactone) (PCL) [2]. Those materials can have limiting factors for applications. For example, esters degrade slowly under acid conditions and cause a lowering of the surrounding tissue´s pH, which can lead to inflammatory reactions. This makes them less suitable candidates for bone grafts [3]. Thus, novel biodegradable materials are needed, and acetals as degradable moieties can be the answer to tackle the limitations of esters. Within this work, the (thermo-)mechanical properties of cyclic acetal photopolymer precursors are determined by RT-FTNIR-photorheology, DMTA, and tensile testing. The influence of the thiols TMPMP, PETMP, and diPETMP, which have an increasing thiol functionality, was studied in thiol-ene systems to photopolymerize biobased, biocompatible, and biodegradable cyclic acetals. The most promising systems implemented were selected and *in vitro* degradation studies at physiological pH levels were carried out on a molecular level *via* NMR analysis. Additionally, swelling and degradation rates of the bulk photopolymer networks were determined, synthesized acetals degrade 80 to 200 times faster compared to similar esters. The developed materials can be cured under mild, physiological conditions and are thus generally applicable as tissue grafts or bone replacement materials.

Keywords: Photoprecursors, Photopolymers, Acetal, Biocompatibility

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