PHOTOPOLYMERIZABLE AND DEGRADABLE BIOMATERIALS BASED ON ACETAL MOIETIES

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The growing trend of minimally invasive surgeries combined with aging societies leads to an increased demand for medicinal graft materials applicable for tissue engineering (TE) [1]. Most materials 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 certain applications. As an example, esters degrade slowly under acid conditions, thus making them less suitable candidates for bone grafts. Furthermore, the formation of acid degradation products lowers the pH in the surrounding tissue and can cause inflammatory reactions [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 linear and cyclic acetal photopolymer precursor are determined by RT-FTNIR-photogeology and DMTA. A thiol-ene system for the photopolymerization of biobased, biocompatible, and biodegradable cyclic acetals was implemented. *In vitro* degradation studies at physiological pH levels were carried out on a molecular level. Additionally, swelling and degradation rates of the photopolymer networks were determined, and it was possible to show that the synthesized acetals degrade 80 to 200 times faster compared to similar esters. Furthermore, the structural variation of acetal moieties from linear to cyclic allows the adjustment of the degradation speed of scaffolds to the desired rates. Moreover, the developed materials can be cured under mild, physiological conditions and are thus generally applicable as tissue grafts.

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