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Novel polymer materials prepared via thiol-ene „click" chemistry

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Thiol-ene ''click'' reactions are believed to be a very promising method to obtain various polymeric materials. Generally thiol-ene coupling can occur in radical conditions; processes catalyzed by nucleophiles, acids and bases or can be solvent promoted in the presence of highly polar media.[1] In our work we performed synthesis of new polymer materials via thiol-ene "click" reaction mechanism.

Polymer materials of different ratios and concentrations of initial monomer mixture were synthesized in the presence of a highly polar solvent N,N-dimethylformamide (DMF) as described in [2]. Initial monomer mixture was based on pentaerythritol tetraacrylate (PETA) or trimethylolpropane triacrylate (TMPTA) as –ene compounds and pentaerythritol tetrakis(3-mercaptopropionate) (PEMP) as thiol compound. Synthesis was conducted at 30°C up to one hour with constant stirring. Reaction resulted in transparent brittle gels. Synthesized gels were washed in DMF and then acetone. When exposed to water obtained gels lost their transparency and turned white. They have shown limited swelling ability in water.

These polymer materials were characterized using different methods such as thermogravimetric analysis, FTIR-spectroscopy and scanning electron microscopy. As synthesized polymers have hydrolytically labile chemical bonds in their backbone, it is assumed that they have a tendency to biodegrade. We studied biodegradation in phosphate buffered saline at pH=7.4 at 37°C with and without addition of esterase.

We suggest that these polymers based on PETA, TMPTA and PEMP could be used as biomedical materials for drug delivery. In future, we plan to test them as implantable drug carriers and study their drug loading and release properties.

Bibliography:

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Keywords: