

# APME17

## Advanced Polymers via Macromolecular Engineering

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# BOOK OF ABSTRACTS

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## CONTROLLING THE MICRO-ENVIRONMENT OF CELLS BY EXPLOITATION OF MACROMOLECULAR PHOTOCHEMISTRY

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Multi-photon-processes are nonlinear optical phenomena only occurring at high photon densities in the focus of femtosecond pulsed lasers thus can trigger photochemistry within confined space (< 1 μm) inside materials. We present a toolbox of biocompatible photochemistry enabling the manipulation of the micro-environment of living cells. Employing two-photon-initiators (2PI) with either photo-crosslinking or photo-degrading systems enables cell-photoencapsulation or photo-milling of channels for directed cell growth, respectively, within a two-photon-lithography device. Materials of choice are hydrogels with precursors based on natural (e.g., gelatin, hyaluronan, etc.) or biocompatible synthetic polymers (e.g. poly(vinyl alcohol)). These precursors were modified with enes (e.g., methacrylates, vinyl esters, norbornenes) or thiols and combined with other (macromolecular) crosslinkers in thiol-ene coupling reactions to form hydrogel networks with arbitrary shape in high resolution. Incorporation of photo-labile groups into networks enables the photo-cleavage of formed crosslinks by the two-photon-process. Taken together these material platforms accompanied by two-photon-technology allow for a spatial-temporal control of the hydrogel properties in the presence of living cells and are therefore an ideal platform technology to study the behavior of cells in different micro-environments.

## BIODEGRADABLE POLYMER NETWORKS VIA TRIAZOLINEDIONE CROSSLINKING OF OLEYL-FUNCTIONALIZED POLY(EPILON-CAPROLACTONE)

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The application of 1,2,4-triazoline-3,5-dione (TAD) “click chemistry” for the formation of biodegradable polymer networks based on poly( $\epsilon$ -caprolactone) (PCL) has been demonstrated. First,  $\alpha$ ,  $\omega$ -oleyl terminated PCLs were prepared by two-step, one-pot syntheses via coordination ring opening polymerization of  $\epsilon$ -caprolactone initiated by oleyl alcohol and subsequent coupling of obtained prepolymers bearing both an oleyl and hydroxyl end group using diisocyanate. Next, polymer networks were synthesized via Alder-ene reaction of two different bifunctional triazolinediones (bisTADs) with oleyl groups present in PCL macromolecules. Different crosslinking parameters were studied in order to find the optimal conditions for the preparation of sufficiently strong polymer networks. Thermal and mechanical properties, as well as the susceptibility of obtained networks to hydrolytic degradation were analyzed. The influence of the PCL molecular weight, nature of the TAD crosslinker and crosslinking stoichiometry on networks properties were determined.

### References

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