

GÖCH-OBERÖSTERREICH PROGRAMMVORSCHAU

15.11.2016

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**“Polyesters and -amides based on
phosphoric acid: Adhesives, flame-
retardants, and stealth polymers”**

Johannes Kepler Universität Linz
17.15 Uhr, T405 (TNF-Turm)



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Modern needs in materials science and bioapplications are manifold: From hydrophobic matrices for tissue engineering to water-soluble protein therapeutics a great variety of polymers is employed to fit to each application. We seek to establish a unique modular protocol to fulfill the demands in these modern needs. The incorporation of uncharged phosphates or phosphonates within the polymer backbone is a unique handle to tune the materials properties both along the main chain but also at the side chains. A key feature of poly(phosphoester)s (PPEs) is the pendant group that is attached to every phosphorus along the backbone.

The materials range from very hydrophobic to highly water soluble PPEs.^[1,2] With the natural phosphate building block a reliable access to biodegradable, biomimetic PPEs is possible. We have developed a reliable protocol based on olefin metathesis (either acyclic diene metathesis or ring-opening metathesis polymerization) for the synthesis of several PPEs with tunable hydrophilicity and degradation rate, high reactivity or adhesion properties.^[3,4] Further, we develop the anionic ring-opening polymerization of five-membered cyclic phosphoesters to novel water-soluble polymers with stealth properties similar to polyethylene glycol, however having the great benefit of being biodegradable.^[1,5,6]

The combination of the pentavalence of phosphorus with modern polymer chemistry allows the synthesis of a material platform for a broad variety of applications, ranging from adhesives or optical applications to tissue engineering scaffolds or polymer therapeutics.

References

- [1] T. Steinbach, S. Ritz, F. R. Wurm *ACS Macro Letters* **2014**, 3, 244-248
- [2] E. M. Alexandrino, S. Ritz, F. Marsico, G. Baier, V. Mailänder, K. Landfester, F. R. Wurm, *J Mater Chem B*. **2014**, 2, 1298-1306.
- [3] T. Steinbach, E. M. Alexandrino, F. R. Wurm, *Polymer Chemistry* **2013**, 4, 3800.
- [4] F. Marsico, M. Wagner, K. Landfester, F. R. Wurm, *Macromolecules* **2012**, 45, 8511.
- [5] T. Steinbach, R. Schroeder, S. Ritz, F. R. Wurm, *Polymer Chemistry* **2013**, 4, 4469.
- [6] S. Schöttler, G. Becker, S. Winzen, K. Mohr, K. Landfester, V. Mailänder, F. R. Wurm *Nat. Nanotech.* **2016**, 11, 372.