

VORTRAGSEINLADUNG

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***Syntheses of aromatic polycondensates in nothing
but hot water***

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Abstract: Hydrothermal polymerization (HTP) is a novel synthetic approach for conceiving highly crystalline condensation polymers. Synthesis-wise, the comonomers are dispersed in H₂O at room temperature and heated to increased temperatures in closed vessels. HTP is geomimetic, i.e. inspired by geological ore formation: numerous minerals crystallize from so-called hydrothermal veins. Natural zeolites, which are aluminosilicates, are for instance exclusively of hydrothermal origin. The formation of silicates from silicic acid species is, mechanistically speaking, nothing but a polycondensation with elimination of the byproduct water. The formation of several organic condensation polymers is closely related: for instance polyimides are generated by condensation of amine with α,β -dicarboxylic acid functions to imide moieties by elimination of H₂O. We could recently show that polyimides can be obtained hydrothermally with outstanding crystallinity. With this talk, I am addressing the following questions: (i) Why does HTP work at all? (ii) Why does HTP yield highly crystalline products while classically synthesized polyimides are semicrystalline at best? (iii) What are the mechanistic ongoing during HTP? (iv) How do the reaction parameters influence the final PI product (e.g. final crystallinity, morphology)? And finally: (v) Where lies the academic and industrial potential of HTP, especially compared to conventional syntheses of polycondensates?

Miriam M. Unterlass performed her BSc studies and MSc studies at the University of Würzburg (chemistry), Ecole Supérieure de Chimie Physique Electronique, Lyon (process engineering), and the Université Claude Bernard, Lyon (materials science). She did her diploma thesis on “Synthesis of new end-functionalized polyethylenes” at the CNRS Laboratory Polymer Chemistry and Process Engineering in Lyon (supervisors: Profs. F. D’Agosto and M. Tromp) and received her MSc degree in 2009. From 2009 – 2011 she performed her doctoral work at the Max Planck Institute of Colloids and Surfaces under supervision of Prof. M. Antonietti. The title of her PhD thesis was “From monomer salts and their tectonic crystals to aromatic polyimides – development of neoteric synthesis routes”. Miriam Unterlass received her doctor’s degree (magna cum laude) from the University of Potsdam in 2011. In 2012 she was working as PostDoc at the CNRS Laboratory “Soft Matter and Chemistry” in the group of Prof. Ludwik Leibler, in 2013 she was a visiting scholar at the MIT, Boston, at Prof. G.C. Rutledge.

Since 2012, Miriam M. Unterlass is junior research group leader at the Institute of Materials Chemistry at the TU Wien. Her research interests comprise high-performance polymers, non-classical polymerizations, green synthesis of aromatic molecules, crystalline polymers, synthesis of new monomers, polymer morphology as well as crystallography. Until now, she has received several awards (e.g., Anton-Paar Science Award 2014, INiTS Startup-Camp Award 2016, ProDidactica Teaching Award 2016), and is member of the Fast Track program of the Robert Bosch Foundation.

Miriam M. Unterlass is author of 17 publications in peer-reviewed journals, and holds 4 patents.