INFLUENCE OF SOLVENT COMPOSITION AND ADDITIVES ON POLYIMIDE MICROPARTICLE MORPHOLOGY

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Fully aromatic polyimides (PIs) are high-performance polymers (HPPs). PIs exhibit outstanding mechanical stability as well as high thermal and chemical resistance. Therefore, PIs find broad application in various fields where they have to withstand extreme working conditions.

We recently reported a novel synthetic approach towards PIs: *Hydrothermal polymerization* (HTP).[1-3] In a typical HTP experiment the comonomers - an aromatic tetracarboxylic acid and an aromatic diamine - are dispersed in H_2O and the mixture is heated to elevated temperatures (> 180˚C) in a closed vessel aka autoclave. Intriguingly, HTP yields PI-microparticles of outstanding crystallinity and flower-like morphology (see **Figure 1**). In preparative inorganic chemistry hydrothermal syntheses are often modified by the addition of co-solvents - the process is then termed "solvothermal". Solvothermal processes are highly interesting for the synthesis of colloidal particles, since solvent composition has a tremendous effect on particle morphology.[4]

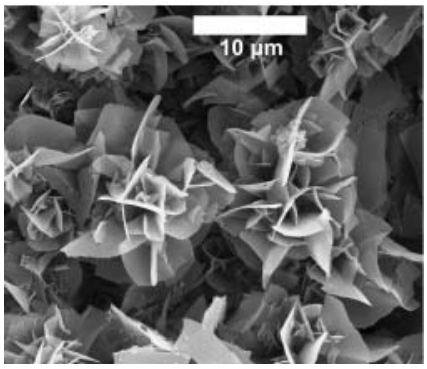

Figure 1: SEM micrograph of flower-like, highly crystalline PI particles.

With this contribution we have set out to study the effect of both additives and co-solvents on HTP. We present a detailed study, which addresses the following questions: (*i*) How do the employed co-solvent influence the polymerization time and the formation of byproducts? (*ii*) How do solvent composition and the presence of additives affect the final PI particles' size, morphology and crystallinity?

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[2] Baumgartner, B.; Puchberger, M.; Unterlass, M. M.; *Polym. Chem.* **2015**, *6* (31), 5773.

[3] Baumgartner, B.; Bojdys, M. J.; Skrinjar, P.; Unterlass, M. M.; *Macromol. Chem. Phys.* **2016**, *217* (3), 485.

[4] Yang, H.G.; Liu G.; Qiao S. Z.; Sun, C. H.; Jin, Y.G.; Smith, S.C.; , Zou, J.; Cheng, H. M.; Lu, G.Q.; *J. Am. Chem. Soc.* **2009**, *131 (11), 4078.*