Synthesis of a helical, water-soluble aramid with a novel method of polymerization

Dinh Phuong Trinh Nguyen

In this master's project, a monomer based on 3-aminobenzoic acid and bearing two polar triethylene glycol derived side chains was synthesized. The subsequent polymer should adopt a helical conformation in solution based on Gong's work in the field of aromatic amide foldamers and be water-soluble. Short, water-soluble polymers were successfully synthesized with a good molecular weight control and low dispersity using a new polymerization method for aromatic amides developed in Kilbinger's group. Longer polymers with high molecular weights and narrow dispersities were more challenging to achieve because of two reasons: the steric hindrance at the chain end of the folded polymer and the supramolecular aggregation of the growing polymer chains that prevented the access to the chain end. Attempts to avoid the supramolecular stacking of the growing polymer chains by changing the polarity of the solvent and strength of the base resulted in failures. The monomer was *N*-protected with another triethylene glycol derived chain as an acid-labile group to disturb the helicity and to allow the growth of the polymer chain. Once the protecting group was cleaved, the polymer was assumed to form a helix. Narrow polydispersity and good molecular weight control were obtained for short polymers; however, high molecular weight polymers showed a broader polydispersity. The purified polymer was water-soluble and its structure was examined by atomic force spectroscopy to confirm its helical conformation.

Prof. Dr. Andreas F. M. Kilbinger