Abstract

The aim of the thesis was the synthesis of new conjugated polymers with cleavable side chains suitable for multilayer construction of light-emitting or photovoltaic devices. For this purpose, *tert*-butyloxycarbonyl (boc)- and amyloxycarbonyl (amoc)-substituted diketopyrrolo[3,4-*c*]pyrrole (DPP)-, dithioketopyrrolo[3,4-*c*]pyrrole (DTPP)- and phenanthridin-6-one (Phe)-monomers were synthesized.

The brominated monomers BrBocDPP, BrBocPhe, and BrAmocPhe were successfully copolymerized via Suzuki cross-coupling with 9,9-dihexylfluorene-2,7-dibornic acid bis(1,3-propanediol)ester. *N*-hexyl-2,7-dibromocarbazole was additionally used as comonomer of the terpolymers. The molecular weights of the copolymers were between 3.4 and 64.9 kDa those of the terpolymers between 6.7 and 23.3 kDa.

Thin films of the protected polymers were prepared on glass substrates with a spin coater. These films were examined on their surface texture in the protected and deprotected state using AFM. AFM studies showed that the films are smooth and homogeneous and there is no change in the surface structure after annealing of the protected films. With a DekTak the layer thickness before and after annealing was determined. The loss in layer thickness was found to be in the error range of the measuring method. Cleavage of the protective groups in the interior of the films probably results in a porous structure, so that the weight loss does not lead to a decrease in the layer thickness of the polymer films.

It is demonstrated that the presence of Boc/Amoc protecting groups in π-conjugated polymers fulfills the purpose of reversible solubility enhancement. The number of protective groups per repeat unit and a high molecular weight have a positive effect on the solubility. All polymers exhibit a bathochromic shift in the absorption bands compared with the monomers. This is especially pronounced for the BocDPP-fluorene copolymer P1B with a shift of $\Delta \lambda = 49$ nm. After thermal deprotection the solubility is greatly reduced due to formation of latent intermolecular hydrogen bonds. The increase in order after cleavage of the protective groups causes a change in the electronic properties. π-π interactions of the chains may also cause a strong reduction in the fluorescence.