Poly(arylene-ethynylene)-*alt*-poly(arylene-vinylene)s for organic photovoltaic applications

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The synthesis, structural characterization and study of structure-property relationships of poly(arylene-ethynylene)-*alt*-poly(arylene-vinylene)s **PAE-PAV**s have been the focus of our research since 2000. **PAE-PAV**s are a class of polymeric systems combining the interesting intrinsic properties of poly(arylene-ethynylene)s, **PAE**s, and poly(arylene-vinylene)s, **PAV**s, into single polymeric backbones, in addition to structure-specific properties. They have proven their worth either as donor components in the design polymer-fullerene bulk heterojunction solar cells[1,2] or as acceptors in polymer-polymer bilayer or blend solar cells.[3,4] It has been demonstrated that the nature (linear or branched) and length of the solubilising alkoxy side chains have a clear impact on the photovoltaic response of these materials. As illustrated in Figure 1, there is an improvement of the photovoltaic performance by shortening the length of the side chain from **1a** to **1c**.[2,5]

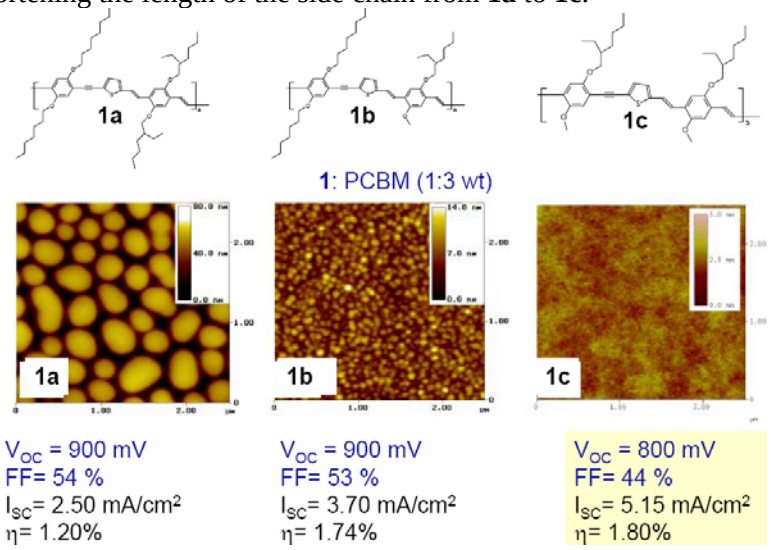

Figure 1: *Effect of side chain length variation on photovoltaic performance*

Presently, we are focusing on the synthesis of low band gap **PAE-PAV** systems with controllable π-π-interchain distances, $\boldsymbol{D}_{\pi\text{-}\pi}$, attained by specific grafting of linear and/or branched alkoxy side chains. We intend to correlate the thin film photoluminescence quantum yield, Φ_f, and $\boldsymbol{D}_{\pi\text{-}\pi}$ -values with the nanoscale morphology of polymer-fullerene bulk heterojunction active layer and the resulting photovoltaic performance. This is achievable through strong scientific interactions with groups in MPI-P Mainz, Germany (Silke Rathgeber) and TU-Ilmenau, Germany (Harald Hoppe). The necessary fundings are provided by the DFG (German Research Foundation) in the framework of "SPP 1355".

1. Hoppe, H.; Egbe, D. A. M.; Mühlbacher, D.; Sariciftci, N. S. *J. Mater. Chem.* **2004**, *14*, 3462.
2. Egbe, D. A. M.; Nguyen, L. H.; Schmidtke, K.; Wild, A.; Guenes, S.; Sieber , C.; Sariciftci, N.S. *J. Polym. Sci. Part. A: Polym. Chem.* **2007**, 45, 1619.
3. Egbe, D. A. M.; Kietzke, T.; Carbonnier, B.; Mühlbacher, D. ; Hörhold, H.-H.; Neher, D.; Pakula, T. *Macromolecules* **2004**, *37*, 8863.
4. Kietzke, T.; Egbe, D. A. M.; Hörhold, H.-H.; Neher, D. *Macromolecules* **2006**, *39*, 4018.
5. Günes, S, Pivrikas, A, Wild, A.; Egbe, D. A. M.; Baumann, R.; Schubert, U. S.; Sacricifti, N. S. *publication in preparation.*