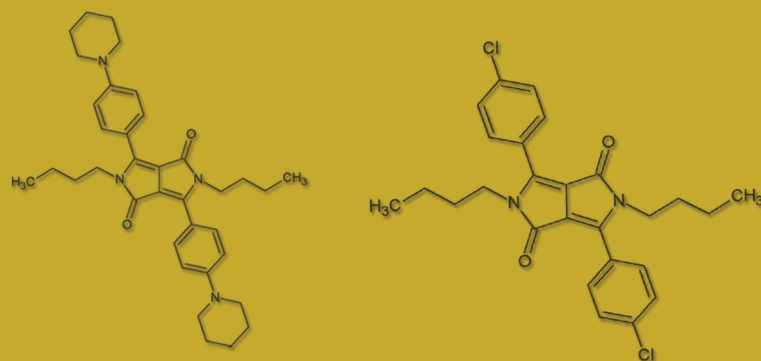
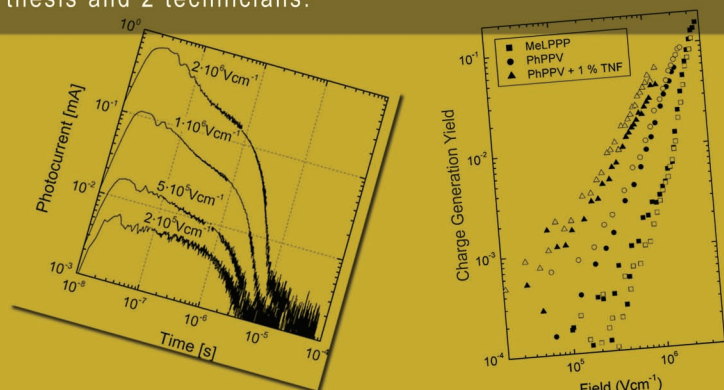


profile

The working group of physics and chemistry of responsible smart materials is well established research team with long term experience in the field of inorganic and organic semiconductors. Since 2002 our research activities are focused on the characterization of organic semiconductors and molecular systems suitable for the construction of new devices transforming the optical signal to electrical response such as photodetectors, solar cells and light driven molecular current switch. Molecular-scale electronic processes in these devices are studied in details. It includes theoretical and experimental study of the optical absorption, luminescence, charge carrier photodissociation and following charge transport, capture and recombination, transistor effect, etc. Techniques for synthesis and characterization of new materials are also routinely used. The research team consists of 4 experienced senior researchers, 3 researcher, 3 PhD. students, 4 students working on their diploma thesis and 2 technicians.

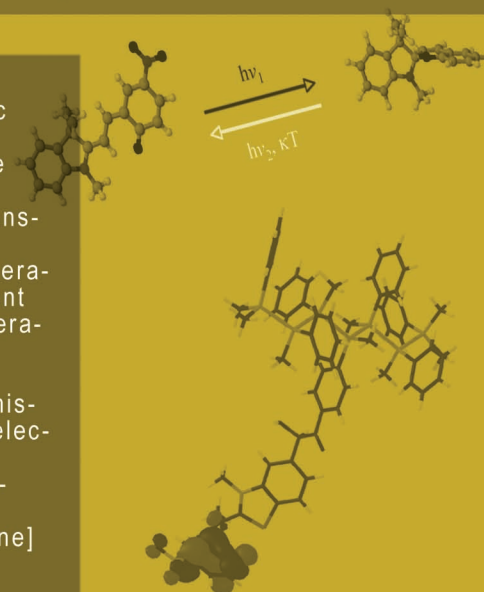


research activities

- preparation of organic semiconductors and deposition of thin films: synthesis of polymers, spin coating method, vacuum evaporation method, plasma enhanced chemical vapor deposition
- photocurrent spectroscopy and time resolved photocurrent measurements (quantum yield of charge carrier generation, charge transport and charge traps, charge carrier mobility)
- steady state and time resolved optical spectroscopy (time resolved spectroscopy supported by 30 ps NdYAG laser and ICCD, UV VIS, IR and luminescence spectroscopy)
- study of optical and electronic properties of thin films (space-charge-limited current techniques, impedance spectroscopy, photoconductivity, electroluminescence, homogeneity of thin films)

recent results

- The effect of photoinduced charge traps on charge transporting properties of organic materials was studied. The obtained findings allowed us to propose a molecular photosensor/switch based on light driven change of charge carriers mobility due to the photochromic reaction of additive[1,2].
- The questions of the origin of the optical charge generation and following charge transport in selected π -conjugated polymers were addressed. It has been argued that the observed transient photocurrent is a convolution of time dependent charge carrier generation and their motion. By comparing the field dependent photogeneration yield, transient absorption of geminate pairs generated of singlet excitons, and double shot photogeneration, the rate limiting steps for photoionization in studied polymers were identified [3, 4, 5].
- New derivatives based on diphenyl-diketo-pyrrolopyrrole were characterized as promising photosensitive materials. The characterization of conductivity, photoconductivity, electroluminescence and charge generation in connection with their high thermal and light stability shows on their high potential for construction of organic electronic devices including solar cells.
- Syntheses and characterization of new materials based on poly[methyl(phenyl)silylene] and dipyrrothienazine - 3-dodecylthiophene copolymers was done.



selected publications

1. M. Weiter, M. Vala, O. Zmeškal, S. Nešpůrek, P. Toman *A Molecular Photosensor Based on Photoswitching of Charge Carrier Mobility*, *Macromol. Symp.*, 2007, 247, pp 318–325
2. M. Weiter, M. Vala, S. Nešpůrek, J. Sworakowski, O. Salyk, O. Zmeškal *Reversible formation of charge carrier traps in poly(phenylenevinylene) derivative due to the phototransformation of a photochromic additive*, *Mol. Cryst. Liq. Cryst.*, 2005, Vol. 430, pp 227-234
3. M. Weiter, H. Bässler *Transient photoconductivity and charge generation in thin films of pi-conjugated polymers*, *J. Lumin.*, 2005, Vol. 112, Iss. 1-4, pp 363-367
4. M. Weiter, V. I. Arkhipov, H. Bässler *Transient photoconductivity in a thin film of a poly(phenylenevinylene) type conjugated polymer*, *Synth. Met.*, 2004, Vol. 141, pp 165-170
5. M. Weiter, H. Bässler, V. Gulbinas, U. Scherf, *Transient photoconductivity in a film of ladder-type poly-phenylene: Failure of the Onsager approach*, *Chem. Phys. Lett.*, 2003, Vol 379, pp 177-182

current projects

- FP7: Development of Photovoltaic Textiles based on novel Fibres (negotiations has begun)
- Photoactive molecular electronic devices: theoretical study and experimental modeling (contract No. 203/06/0285 by GACR, 2006-2008)
- Molecular-scale electronic processes in materials suitable for organic photosensitive devices (contract No. A401770601 by GA AS CR, 2006-2009)
- Nanomaterials and functional systems for electronic devices based on DPP and CPP compounds (contract No. FT-TA3/048 by MPO of CR: 2006-2008)
- Molecular nanosystems and nanodevices: electric transport properties (contract No. KAN401770651 by AS CR: 2006-2010)