655. WE-Heraeus-Seminar:

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Program and Abstracts

Fast photoconversion in viologen-doped lyotropic ionic liquid crystals

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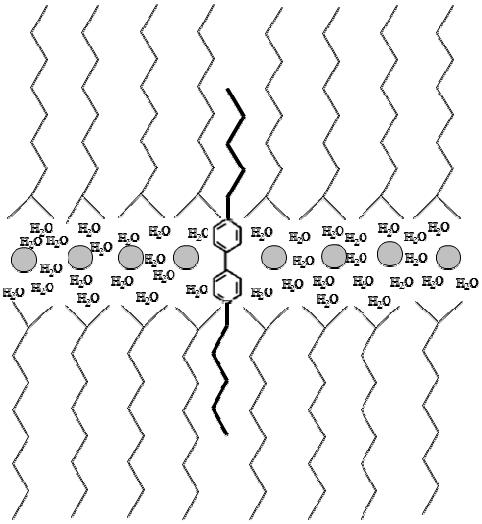
Possessing all the peculiarities of ionic liquids the Ionic liquid crystals (ILC) represent an individual, very particular class of liquid crystals with fascinating prospects for many applications as, for instance, a template for precise synthesis of semiconductor or metal nanoparticles and their spatial stabilization [1]. Their structural diversity allows for introduction of anions and cations with different properties. In addition to the thermotropic mesophase the metal-alkanoate-based ILC's are capable of forming the lyotropic one, which retains the typical smectic A structure. Electrochromic molecules of viologen class introduced into the lyotropic matrix do not interfere with its liquid crystalline ordering and appeared to be built in smoothly (Figure).



By two-wave mixing of the radiation of Q-switched Nd:YAG pulsed laser we study nonlinear optical response of our LILC-viologen composite materials. Observed strong nonlinearity (n_2 ~ 10^{-8} $cm^2 \cdot W^{-1}$) correspond to the best characteristics of organic compounds under resonance excitation. Experimental data are in good agreement with the theoretical model describing a new nonlinear optical mechanism of reversible photo-conversion between excited dimers and cation radicals, the reduction products of viologen molecules. The studied ionic liquid crystalline materials characterized with large and fast nonlinear response deemed to be promising media for holographic recording realization [2].

References

[1] T. Mirnaya and S. Volkov, Green Industrial Applications of Ionic Liquids, NATO Science Series II, Kluwer, Dordrecht (2003)

[2] G. Klimusheva, S. Bugaychuk, Yu. Garbovskiy, O. Kolesnyk, T. Mirnaya and A. Ishchenko, Opt.Lett. **31**, 256 (2006)