Jozef Stefan Institute, Department of Theoretical Physics

Condensed Matter Group Seminars

Zala Lenarčič

F1, Jozef Stefan Institute

Charge recombination in excited one-dimensional organic Mott insulators

Recent femtosecond pump-probe experiments on Mott-Hubbard insulators [1-2] reveal charge recombination, which is in picosecond range, much faster than in clean band-gap semiconductors. I will present our proposal for the mechanism that explain the recombination in effectively one-dimensional organic salt ET-F_2TCNQ [2]. I will show that fast recombination processes can be explained even quantitatively assuming that charge energy is transmitted to molecular vibrations. As suggested by experiments it is assumed that effectively positive (holon) and negative charge excitations (doublon) are bound in an exciton. Based on a model that ensure the existence of exciton and couples the charge to vibrations we can express the recombination rate analytically. At a reasonable coupling to vibrations the observed recombination rate is reproduced. I will comment also the sub-leading effect of spin background, which is for one-dimensional systems decoupled from charge.

[1] H. Uemura, H. Matsuzaki, Y. Takahashi, T. Hasegawa, and H. Okamoto, J. Phys. Soc. Jpn. **77**, 113714 (2008).
[2] M. Mitrano et al, Phys. Rev. Lett. **112**, 117801 (2014).

Tuesday, January 27th, 3:00pm

Seminarska soba za fiziko, Jozef Stefan Institute