Tripletų anihiliacija 9,10-difenilantraceno dariniuose: interkombinacinės konversijos bei eksitonų difuzijos įtaka

Triplet – triplet annihilation in 9,10 – diphenylanthracene derivatives: the role of intersystem crossing and exciton diffusion

Tomas Serevičius[1*], Regimantas Komskis[1], Povilas Adomėnas[1], Ona Adomėnienė[1], Andy Monkman[2] and Saulius Juršėnas[1]

[1]Institute of Applied Research, Vilnius University, Sauletekio 3, 10257, Vilnius, Lithuania

[2]Department of Physics, Durham University, South Road, Durham, DH1 3LE, UK

tomas.serevicius@ff.stud.vu.lt

Triplet – triplet annihilation (TTA) is an attractive way to boost the efficiency of conventional fluorescent OLEDs. TTA-active anthracene derivatives are often considered as state-of-the-art emitters due to the proper energy level alignment and high fluorescence efficiency. Here we present two different methods to enhance the TTA efficiency. We show that the intensity of TTA-based delayed fluorescence directly depends on the intersystem crossing (ISC) rate. This ISC rate can be significantly enhanced in more conjugated compounds due to the resonant alignment of S_1 and T_2 energy levels. While enhanced ISC rate slightly quenches the intensity of prompt fluorescence, the rise of the triplet population boosts the intensity of resultant delayed fluorescence. Secondly, the triplet annihilation rate can be significantly enhanced by optimization of triplet exciton diffusion regime in the films of anthracene derivatives (see Fig. 1).

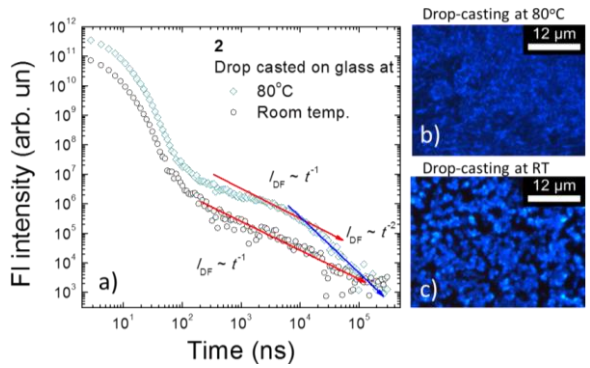

Fig.1 a) Log – log scale decay transients of 50 wt% Zeonex films of DPA compound **2** prepared by drop-casting on glass at room temperature (circles) and 80°C (squares). b) and c) Fluorescence microscopy images of 50% wt Zeonex films of DPA compound **2** drop – casted at room temperature and 80°C, respectively.

We show that the proper layer preparation technology has a crucial influence on uniformity and energetic disorder of the film. This enhances the non-dispersive triplet diffusion and increases the resulting delayed fluorescence intensity. The variation of TTA properties was showcased in a several series of highly fluorescent anthracene compounds decorated with various aryl and alkyl fragments at C-2, C-9 and C-10 positions.

Keywords: anthracene, triplets, annihilation, OLEDs.