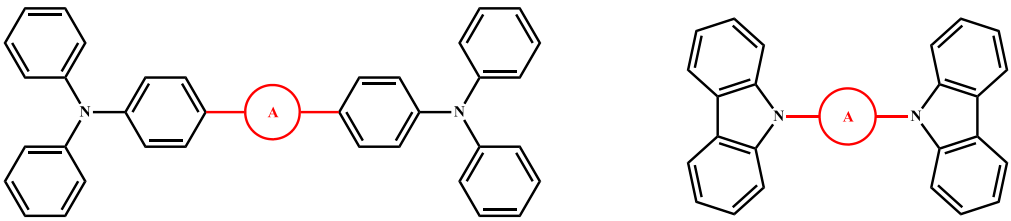
TRIPHENYLAMINE- AND CARBAZOLE-BASED COMPOUNDS EXHIBITING DELAYED FLUORESCENCE

Uliana Tsiko, Galyna Sych, Yan Danyliv, Iryna Hladka, Juozas Vidas Grazulevicius

Department of Polymer Chemistry and Technology, Kaunas University of Technology, Lithuania
ulyana.ziko@gmail.com

Organic electroactive materials are widely used in organic optoelectronic devices. Organic semiconductors with donor-acceptor structures are widely applied in organic light diodes (OLEDs) [1]. Compounds exhibiting thermally activated delayed fluorescence in solid state are ideal emitters for implementation in non-doped OLEDs [2].

The compounds containing pyrimidine electron-withdrawing moiety and electron-donating moieties such as triphenylamine and carbazole were synthesized and investigated (Fig1.).



1 **2**

Fig. 1. General structures of triphenylamine- and carbazole based compounds

The toluene solution of compound **1** containing triphenylamino moiety demonstrated sky-blue emission with photoluminescence intensity maximum centered at 486 nm while this compound in solid state exhibited emission with the intensity maximum at 506 nm (Table 1.). The toluene solution of compound **2** emitted light in blue region with emission maximum at 466 nm and the film of the compound with carbazole units exhibited emission in sky-blue region with maximum at 488 nm. The compound containing triphenylamine moieties demonstrated high photoluminescence quantum yield of 45 % in solid state and in toluene solutions (83 %). Compound **2** exhibited lower value of photoluminescence quantum yields of 33 % and 2 % in solid state and toluene solutions respectively. Both the compounds showed thermally activated delayed fluorescence.

Table 1. Photophysical characteristics of compounds **1** and **2**

Compounds	$\lambda^{Tol}_{PL,}$ nm	$\lambda^{film}_{PL,}$ nm	Φ^{Tol}_{PL}, %	Φ^{film}_{PL}, %
1	486	506	83	45
2	466	488	2	33

[1] Goushi K., Yoshida K., Sato K. et. al., Organic light-emitting diodes employing efficient reverse intersystem crossing for triplet-to-singlet state conversion, Nat. Photonics **6**, 253–258 (2012).
[2] Guo J., Li X.-L. Nie H. et. al., Achieving High-Performance Nondoped OLEDs with Extremely Small Efficiency Roll-Off by Combining Aggregation-Induced Emission and Thermally Activated Delayed Fluorescence. Adv. Funct. Mater. **27**, 1606458 (2017).