PHENOXAZINES HAVING VARIOUS ELECTRON ACCEPTOR OR DONOR FRAGMENTS AS NEW HOST MATERIALS FOR PHOSPHORESCENT OLEDs

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Fluorescent materials were used as emitting materials of organic light emitting diodes (OLEDs), but the intrinsic low internal quantum efficiency of 25% of the fluorescent emitting materials limited the application of fluorescent OLEDs [1, 2]. It is known that the ratio of singlet excitons to triplet excitons is 1:3 and the triplet excitons cannot be utilized for light emission in common organic emitting materials because of non-radiative decay of triplet excitons via internal conversion process [3]. The radiative transition from the triplet excited state to the singlet ground state is a forbidden transition, but the transition can be allowed in organometallic complexes with heavy metals, which are used in phosphorescent OLEDs [4]. Suitable host materials should be used for the organometallic complexes. We will present a series of new phenoxazine-based derivatives as host materials for the triplet emitters. The synthesis of phenoxazine-based host materials **4**–**6** was carried out by a multi-step synthetic route. New materials **4**-**6** are shown in Figure 1.

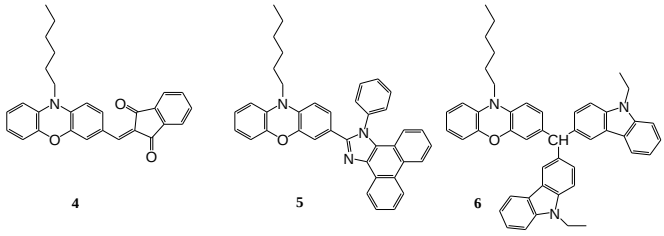

Fig. 1. New host materials **4**–**6**.

The new electro-active materials were synthesized using phenoxazine as electron donor fragment connected with various electron acceptors or donors. Some of the materials formed homogeneous solid amorphous films with glass transition temperatures of 75–93 °C. Layers of the synthesized compounds showed ionization potentials of 5.24–5.56 eV. The compounds, which formed homogenous amorphous layers, were tested as host materials for green phosphorescent OLEDs by using green triplet emitter of bis[2-(2-pyridinyl-N)phenyl-C](acetylacetonato)iridium(III), $Ir(ppy)_2(acac)$ as the guests. The device with the host of 3-[bis(9-ethylcarbazol-3-yl)methyl)-10-hexylphenoxazine exhibited the best overall performance. The efficient green OLED using the host demonstrated low turn-on voltage of 3.1 V, a maximum brightness of 5366 cd/m^2, external quantum efficiency exceeding 5.9% and maximum current efficiency of 18.3 cd/A.

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