

Synthesis and Electro-phosphorescent Properties of Carbazole-based Bipolar Host Materials Incorporating of a Trifluoromethyl Moiety

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Extended Abstract

For more than ten years, the progress of device performances of phosphorescent organic light emitting devices (PHOLEDs) has drawn tremendous attention because of their high quantum efficiency as well as their potential applications in full-color flat-panel displays and solid-state lighting applications.

In research field for PHOLEDs, a host material plays a crucial role in determining the device performances (*e.g.*, external quantum efficiency, current efficiency, and lifetime through charge balance and efficiency energy transfer). Thus, designing host materials with these features remains a challenge for materials scientists. One of the most widely used building blocks for host materials in blue PHOLEDs is a carbazole moiety having excellent hole-transporting property and large triplet energy. Meanwhile, the carbazole structure showed poor electron-accepting property. To surmount this constraint, many host materials possessing bipolar properties for PHOLEDs have been developed. In order to construct bipolarity in the carbazole-based host material designs, a large number of moieties capable of electron-accepting such as pyridine, triazole, triazine, phenanthroline, oxadiazole, benzimidazole, phosphine oxide, and phosphine sulfide, were incorporated to be a bipolar host materials.

On the other hand, although it has been reported that introducing the simple and electron-accepting trifluoromethyl group into organic molecules can enlarge the electron affinity for more efficient electron injection and can benefit electron transport, thus far there is no report of bipolar phosphorescent host materials based on the combination of carbazole and the trifluoromethyl group. In the present work, we report the synthesis and characterization of a novel asymmetric bipolar and high-triplet-energy phosphorescent host materials, 9-(3-(3-(trifluoromethyl)-9H-carbazol-9-yl)phenyl)-9H-carbazole and 9-(3-(9H-carbazol-9-yl)-5-(trifluoromethyl)phenyl)-9H-carbazole, that incorporates one trifluoromethyl group onto mCP as carbazole position and phenyl position, respectively.

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