

4th European

ORGANIC CHEMISTRY CONGRESS

March 01-03, 2018 | London, UK

One-step catalyst free C-N coupling reaction for various efficient OLED materials

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OLEDs have attracted great attentions from both academia and industry for decades because of their potential applications in full color flat-panel displays and solid state lightings. An ideal organic material for OLEDs is to possess a cost-effective synthesis and the state-of-the-art performances. It is interesting that, the previously reported various organic materials which exhibited the state-of-the-art device efficiencies over 20% all possess very simple molecular structures and most of their design and synthesis have been focused mainly on a multi-step strategy. Therefore, from the materials point of view for the commercialization of OLED, it is highly desirable to develop organic materials possessing simple chemical structures and high device efficiencies together with the simplest synthetic chemistry by directly using commercially available inexpensive starting materials. Based on this concept, diverse OLED materials are synthesized by a simple one-step catalyst free aromatic nucleophilic substitution reaction with various nucleophiles and electrophiles. The various OLED materials comprise of organic host materials for phosphorescent and thermally activated delayed fluorescence (TADF) OLEDs, TADF emitters and electron-transport materials as n-type electron-acceptors for donor/acceptor type exciplex. Moreover, the structure-property (thermal, photophysical, electrochemical, theoretical and electroluminescent properties) relationships are systematically investigated.

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