Youngmin You, J Phys Chem Biophys 2017, 7:4(Suppl)
DOI: 10.4172/2161-0398-C1-025

Intra- and intermolecular strategies to improve photoluminescence quantum yields of n-π* fluorophores capable of harvesting triplet excitons

Youngmin You
Ewha Womans University, South Korea

Spin statics of excitons is the key factor that determines the efficiency for interconversion between photon and electron. For example, internal quantum yields of electro-fluorescence devices are limited by 25% in the absence of processes that aid intersystem crossing. Charge collection efficiencies in photovoltaic devices are also intimately associated with spin distributions. Efforts have, thus, been paid to develop the materials that overcome the spin selection rule. Notable examples include organometallic complexes of Ir(III) or Pt(II) which exhibit strong spin-orbit coupling. Of recent interest are dipolar organic molecules and coordination compounds of Cu(I). These compounds possess charge-separated excited states with small exchange energies. This electronic structure allows for thermally activated reverse intersystem crossing, leading to exciton-harvested fluorescence emission. Our group was intrigued by the key role of the excitonic spin states in electroluminescence devices. We investigated the fluorescence properties of chromophores bearing n-π* transitions. Although n-π* molecules can serve as electroluminescent materials because of the harvesting of singlet and triplet excitons through El-Sayed-rule-allowed reverse intersystem crossing, the weak fluorescence emissions of such molecules have prevented applications into devices. To enable systematic studies, we prepared a series of electron-deficient coumarin compounds having aryl substituents with different band gap energies. We observed two orders of magnitude improvement in fluorescence quantum yields upon facilitating intra- and intermolecular electron transfer to the coumarins. Special focus has been paid to understand the electron-transfer processes and the molecular factors that controlled the kinetic steps. The mechanistic studies revealed that judicious control over excited-state potentials was crucial to achieve efficient fluorescence.

Biography

Youngmin You is an Associate Professor of the Division of Chemical Engineering and Materials Science at Ewha Womans University. He completed his Bachelor and Master degrees in Chemical Engineering at Seoul National University in 1997 and 2003, respectively. He obtained his PhD degree in 2007. He started his independent carrier as an Assistant Professor at Kyung Hee University in 2013, and moved to Ewha Womans University in 2015. He focuses on the development of novel molecules and photo-electro-functions. His current research interests include luminescent molecules for exciton harvesting and circularly polarized emission, photo-redox catalysis, and photo-luminescent bio-probes. He published 54 papers, including six review articles.

odds2@ewha.ac.kr

Notes: