# Design New Exciplex-forming Systems for OLEDs Application

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The intermolecular charge transfer occurring at the interface between an electron donor (D) and an electron acceptor (A) can give an excited state called “exciplex”. In another way, exciplex can be generated by the recombination of electron and hole injected from different electrodes and accumulated at the interface between hole- and electron-transporting materials in organic light-emitting diode (OLED). Because the small energy difference between the singlet and triplet states, exciplex can perform efficient thermally activated delayed fluorescence (TADF). Therefore, exciplex can be feasibly utilized as emitting or host material to make high efficiency OLED. In this research project, we used solution-process to search for new exciplex-forming systems. To prepare good thin film by spin-coating method, we used newly synthesized polymer together with commercially available polymer Poly(9-vinylcarbazole) (PVK) as electron donor to cross-mix with three different triazine-based electron acceptors. We studied the suitable composition (solvent, donor/acceptor ratio) and coating conditions for thin film formation. We then examined the emission behavior of six donor-acceptor mixed films as compared to those of pure donors and acceptors to find new exciplex forming combination. The identified best exciplex-forming system was then utilized as host for studying the energy transfer behavior upon introducing fluorescent or phosphorescent guest. Finally, the designated donor-acceptor-emitter composition was utilized to make OLED devices. The device characteristics were studied.

**Awards Won:**
Fourth Award of $500