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第54回 ISIT有機光エレクトロニクス研究特別室セミナー
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“Novel Phosphorescent Heteroleptic Iridium(III) Complexes
for Highly Efficient Organic Light-Emitting Diodes”

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Heteroleptic iridium(III) complexes $[(C^{\wedge}N)_2Ir(LX)]$, $LX =$ ancillary ligands] are very promising phosphorescent emitters, because easy synthetic chemical accessibility compared with the corresponding homoleptic $Ir(C^{\wedge}N)_3$ complexes. In the past decades, extensive studies have been carried out on heteroleptic iridium(III) complexes bearing cyclometalated ($C^{\wedge}N$) ligands, with a variety of bidentate, monoanionic ancillary ligands. However, complexes are mainly limited to acetylacetonate (acac) ancillary ligated heteroleptic iridium(III) complexes $[(C^{\wedge}N)_2Ir(acac)]$. Although many of these heteroleptic iridium(III) complexes showed good photoluminescence, only a few of them were reported to show high electroluminescence (EL) efficiency, because of self-quenching and triplet-triplet (T-T) annihilation which could cause significant efficiency roll-off at higher currents/luminance. To overcome these problems, the design and synthesis of more efficient, new phosphorescent iridium(III) complexes are highly desired. We recently found that sterically demanding amidinate and guanidinate can serve as excellent ancillary ligand for the heteroleptic iridium(III) complexes, leading to significant improvement of the emitting properties, such as reduction of self-quenching and insensitivity to doping concentration. Improvement of hole-injection and hole-transporting properties of the resulting complexes can also be expected. Amidinate and guanidinate ligated heteroleptic iridium(III) complexes can serve as excellent emitting materials for OLEDs, exhibiting both high current efficiency (up to 137 cd/A) and high power efficiency (up to 90 lm/W) under appropriate conditions. The electroluminescence (EL) color could be changed in the wide range from bluish green to perfect red by choosing appropriate ligands. In this series, I will discuss about new family of heteroleptic iridium(III) complexes based on 2,2'-dipyridylamido (dpa) groups as a chromophoric ancillary ligand, $[Ir(C^{\wedge}N)_2(dpa)]$. These complex shows very strong emission at room temperature, and can serve as an efficient phosphorescent dopant for OLED application with high current efficiency (123.5 cd A^{-1}) and high power efficiency (43.2 lm W^{-1}).

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