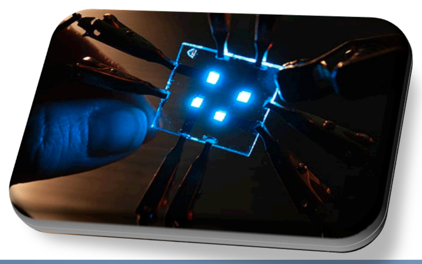
Strategies Towards the Generation of Highly Luminescent Blue Emitters for Light-Emitting Electrochemical Cells



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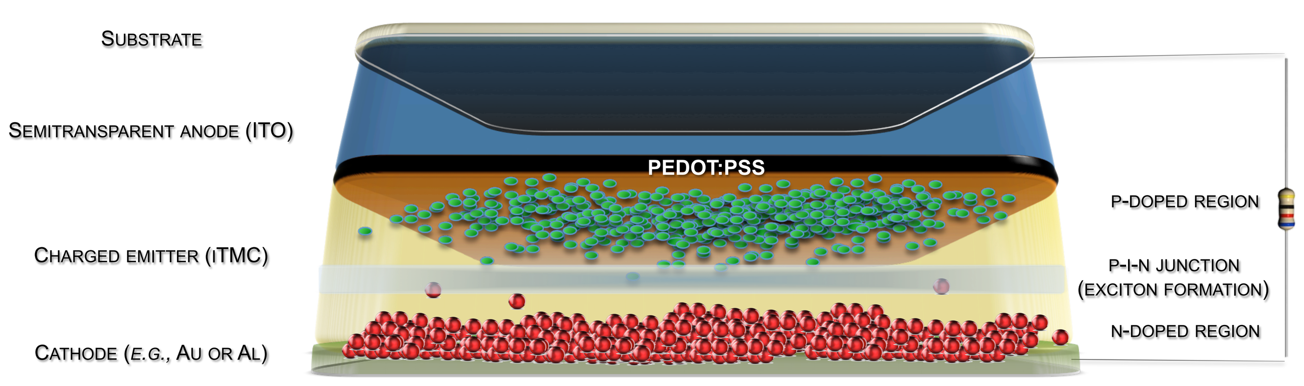
INTRODUCTION

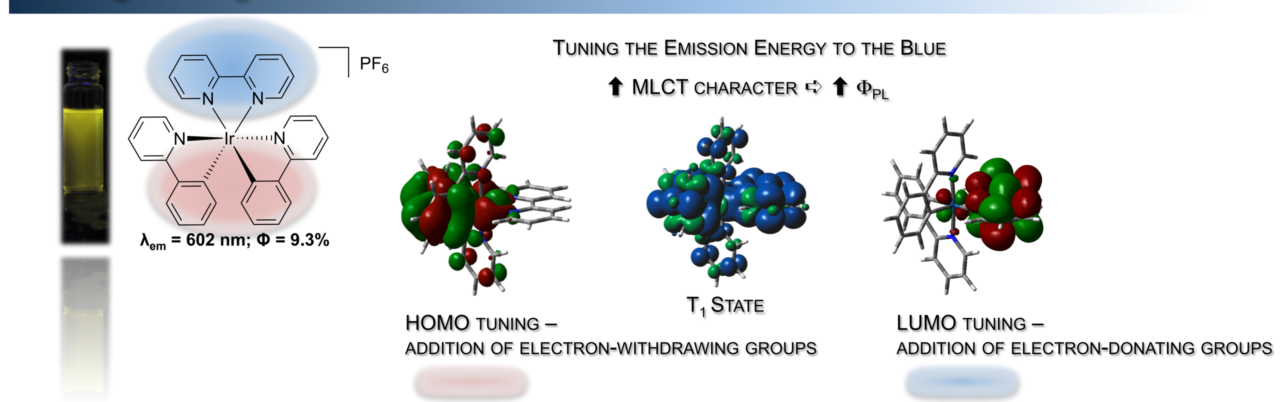
Light-emitting electrochemical cells (LEECs) are a type of solid-state lighting based on a simple architecture (right), consisting of a singlet active layer composed of a phosphorescent ionic transition metal complex (iTMC). LEECs are promising candidates for large area flat panel lighting as they

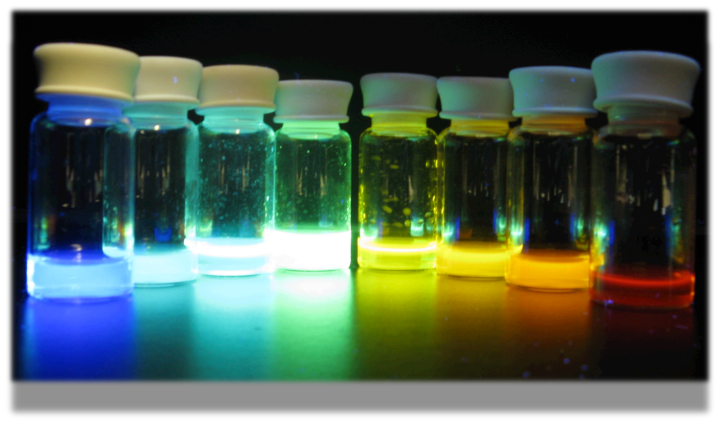
- Use air-stable electrodes
- Exhibit high luminescence efficiencies
- Can be easily fabricated using roll-to-roll solution processing techniques
- Are AC drivable
- Use less energy during operation

However, design challenges remain. One issue that must be addressed is the development of a truer-blue emitter that, when incorporated into the LEEC, results in a bright and stable device.

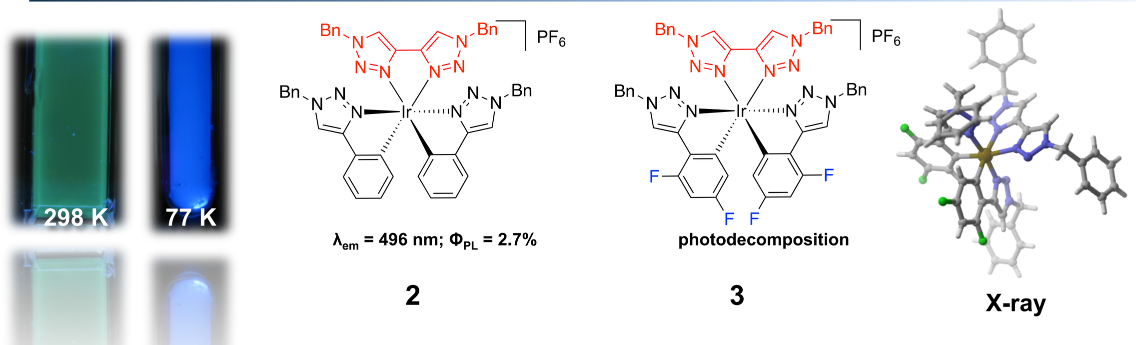


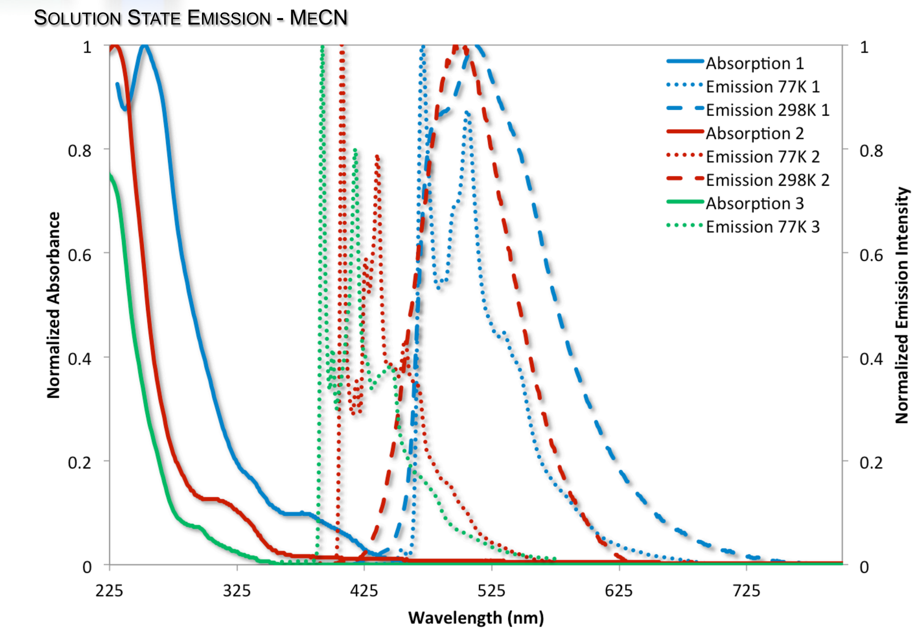
Design Paradigm



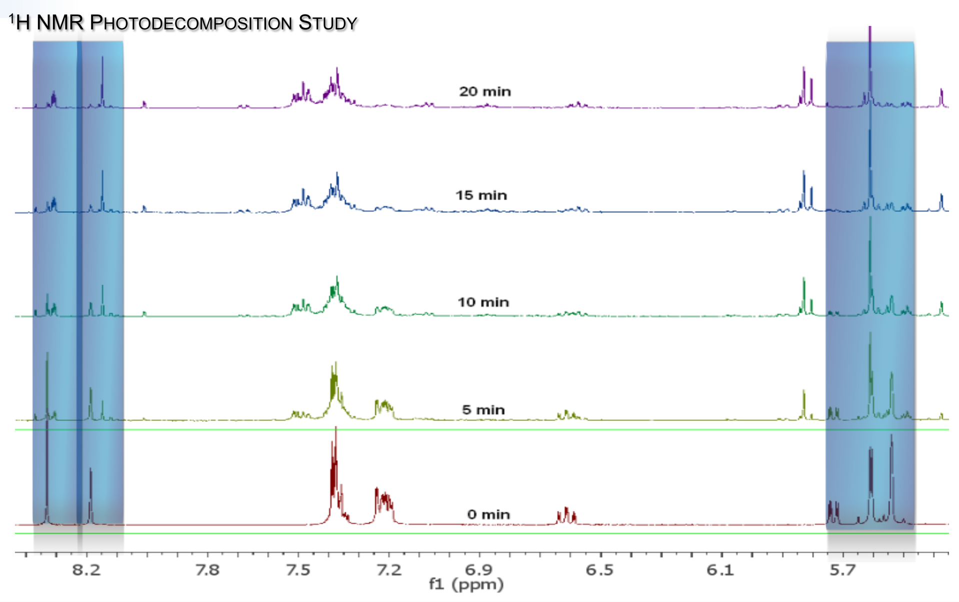


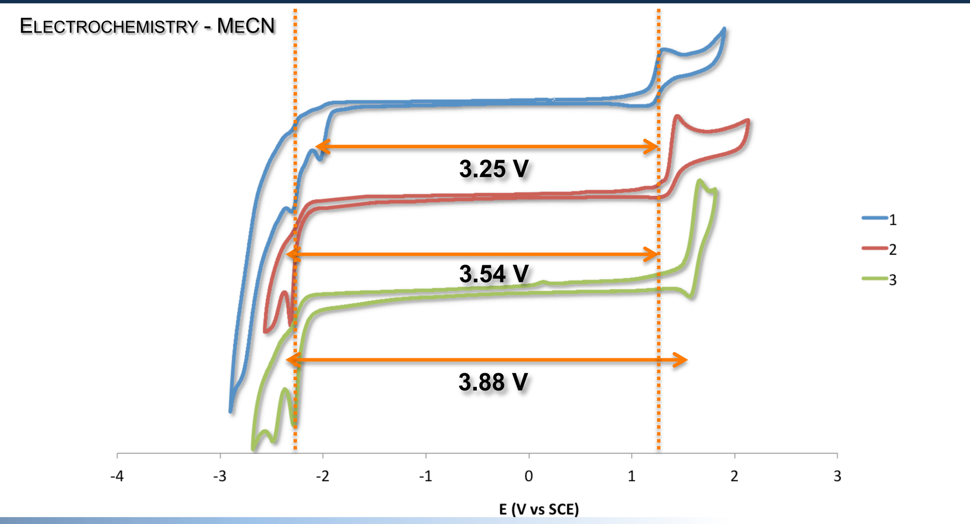
The Use of Aryltriazoles as Cyclometalating Ligands – 4th Generation



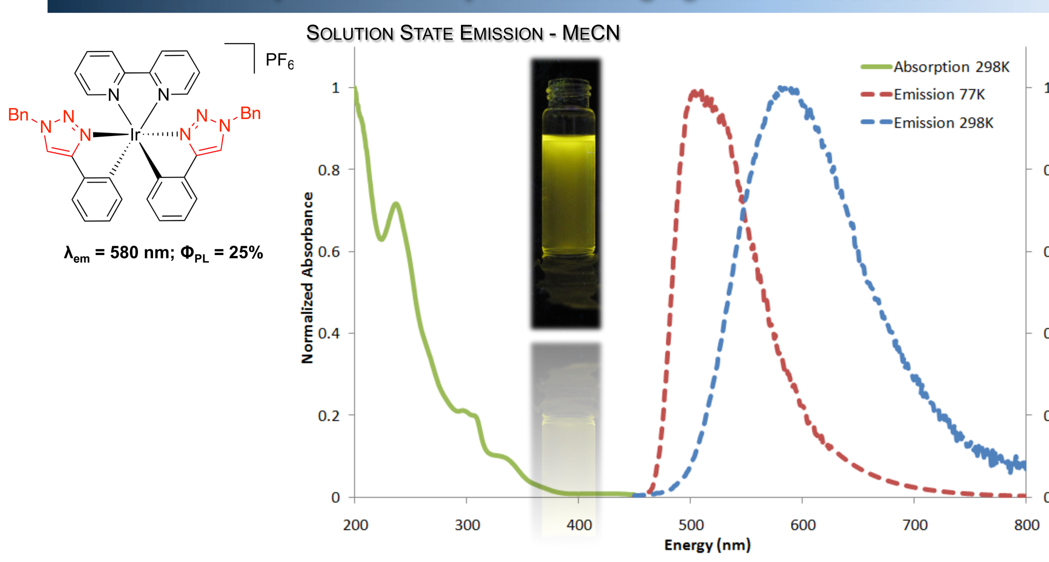


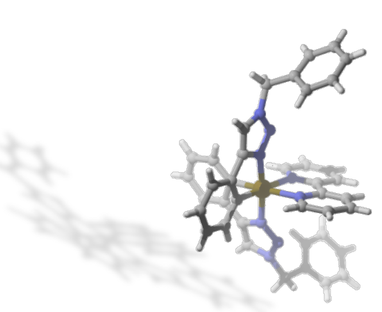
Dalton Trans., 2013, *42*, 8402

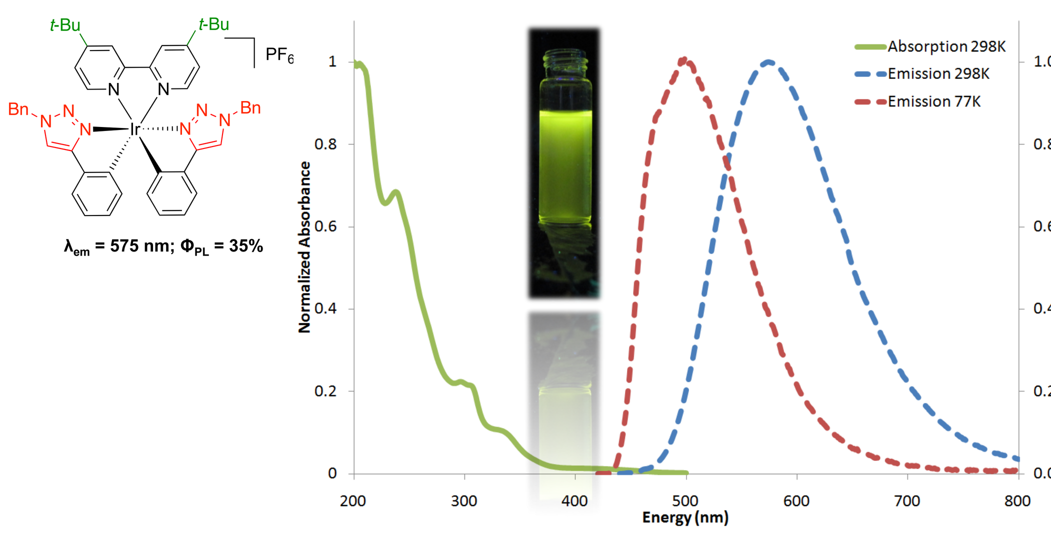


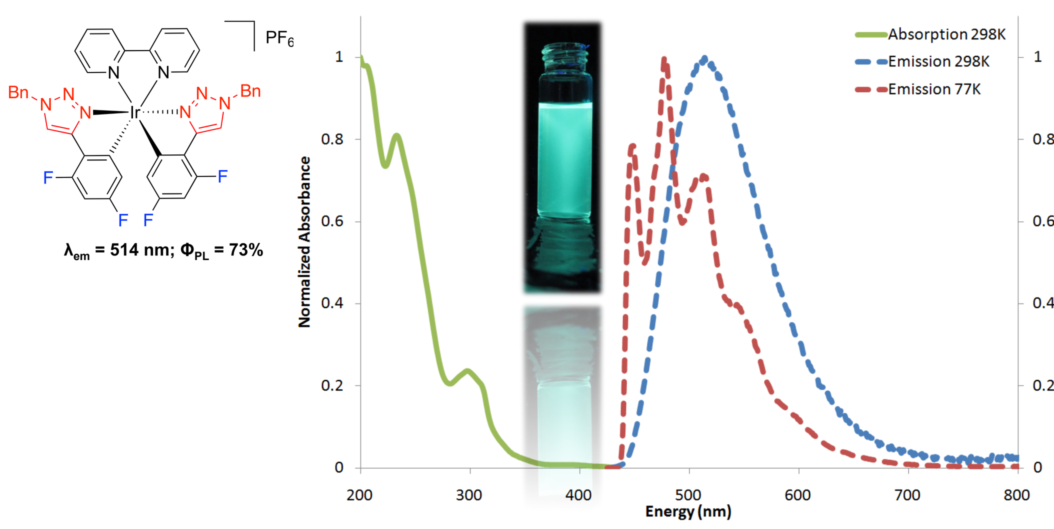


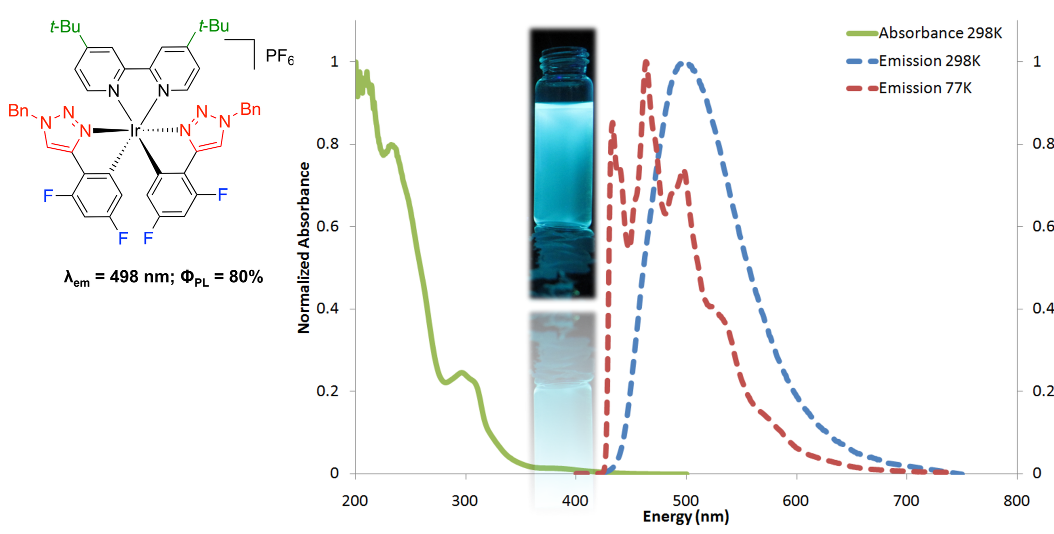
The Use of Aryltriazoles as Cyclometalating Ligands – 1st Generation









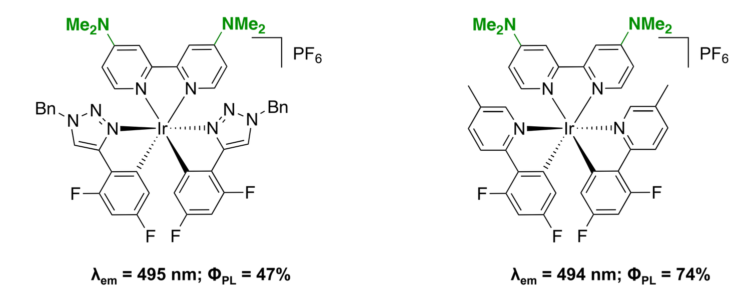


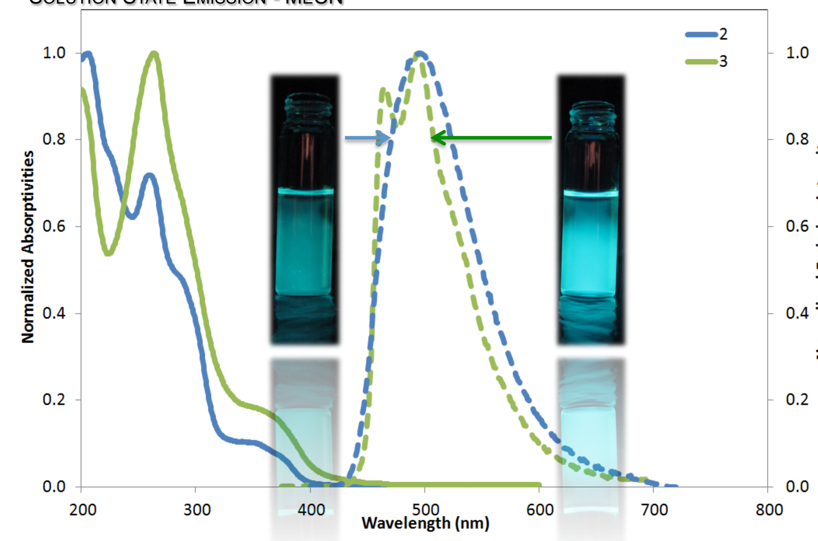
One-pot synthesis: *Synthesis*, **2011**, *22*, 3604

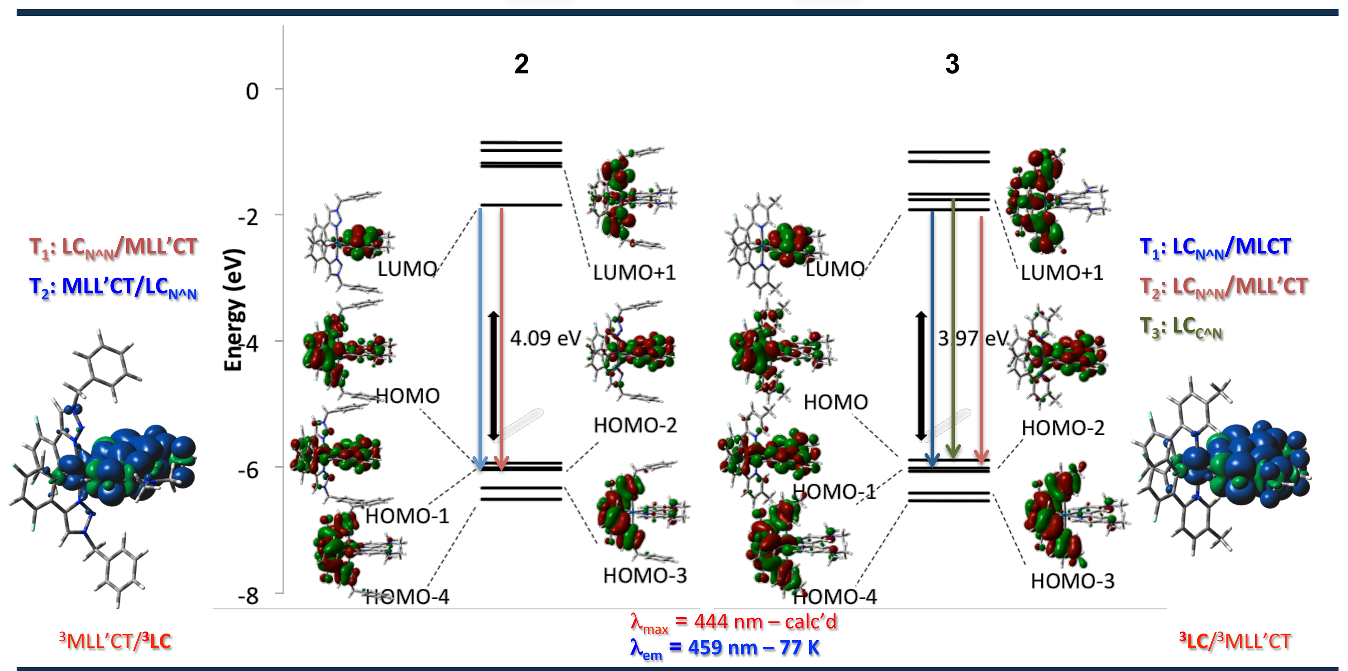
Structure-property study: *Inorg. Chem.*, **2011**, *50*, 11514

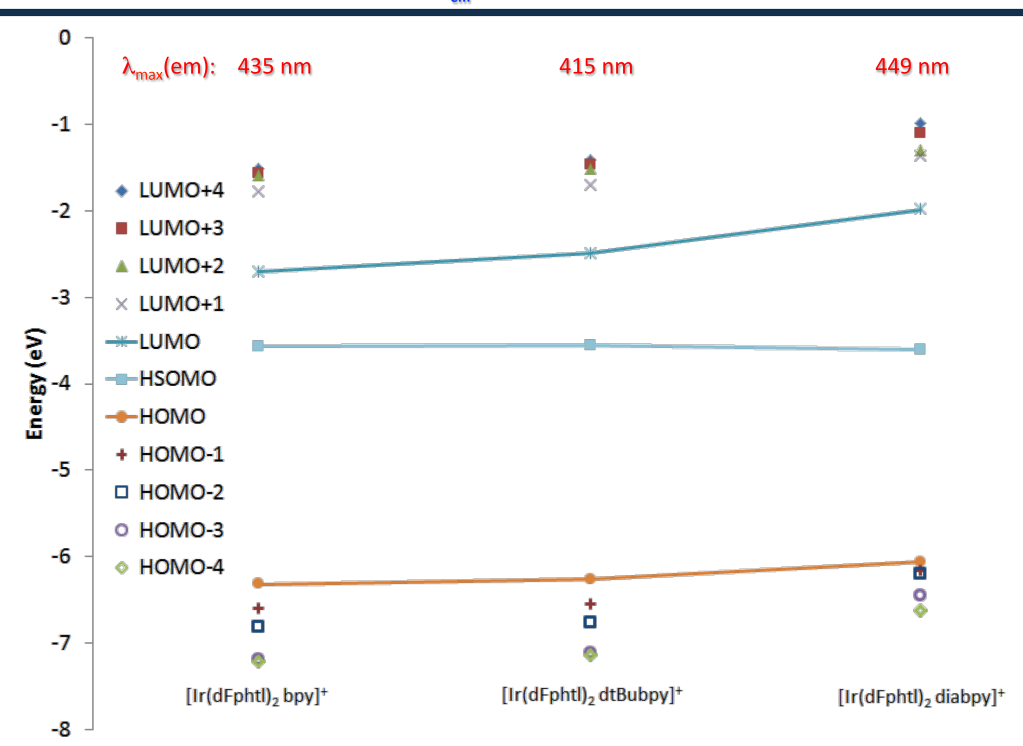
ECL study: *Chem. Commun.*, **2012**, *48*, 3179-3181

The Use of Aryltriazoles as Cyclometalating Ligands – 2nd Generation





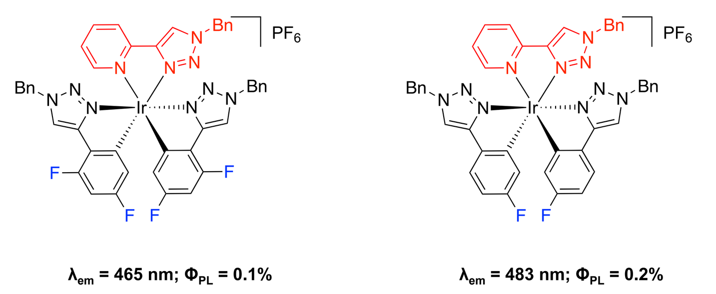


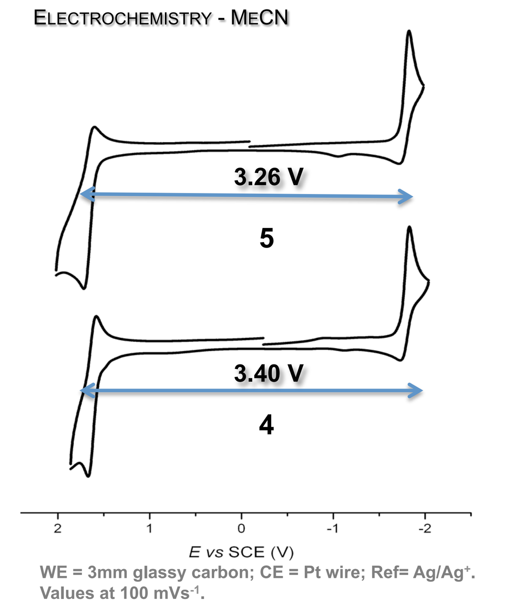


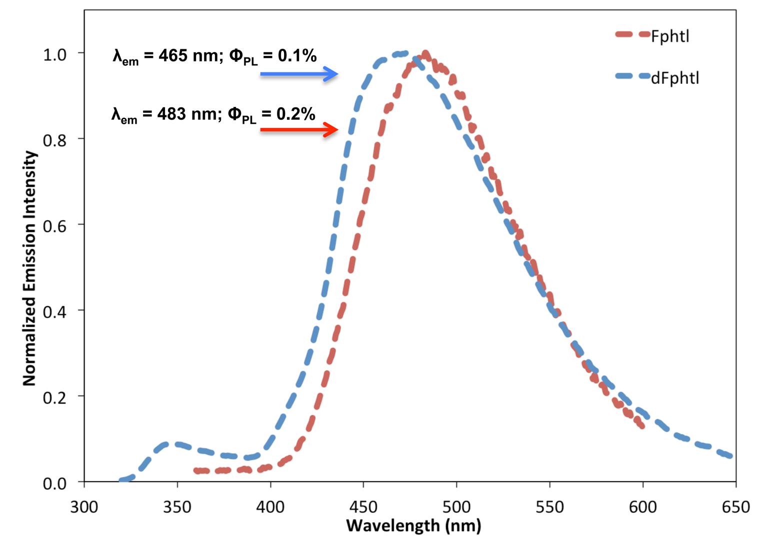
2nd Generation study: *Chem. Eur. J.*, **2013**, *submitted*

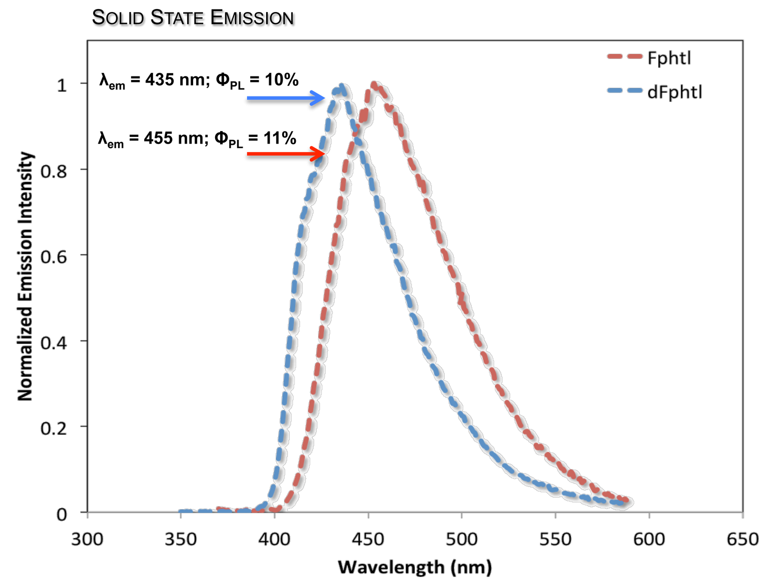
ECL studies: *ACIE*, **2012**, *51*, 11079; *RSC Adv.*, **2013**, *submitted*

The Use of Aryltriazoles as Cyclometalating Ligands – 3rd Generation









LEECs

5

LEEC (9V): λ_{max} = 487 nm; L_{max} = 13 cd m^{-2}; $t_{1/2}$ =48 min; EQE = 0.14%

4

LEEC (9V): λ_{max} = 508 nm; L_{max} = 25 cd m^{-2}; $t_{1/2}$ = 72 min; EQE = 0.48%

J. Mater. Chem. C, **2013**, *submitted*

CONCLUSIONS

The use of triazole-containing ligands represents a promising avenue towards the generation of blue-emitting cationic Ir(III) complexes and their successful incorporation into functional blue-emitting LEECs.

Current work is focused on replacement of the fluorine atoms in the cyclometalating ligands with other electron-withdrawing functionalities as F-C_{aryl} bonds have been shown to be cleaved under electroluminescent conditions in related OLED architectures.

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