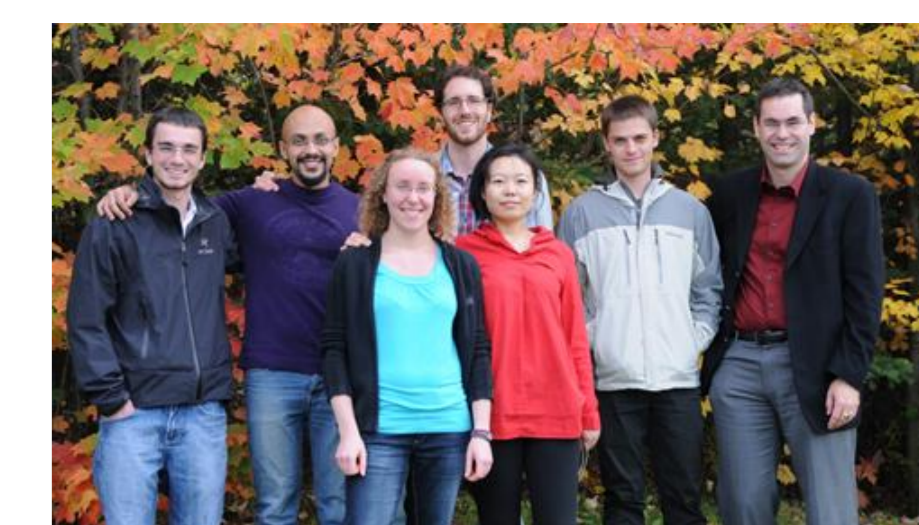
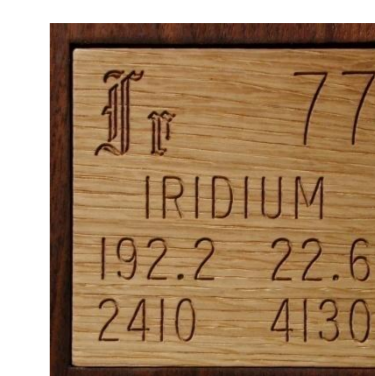
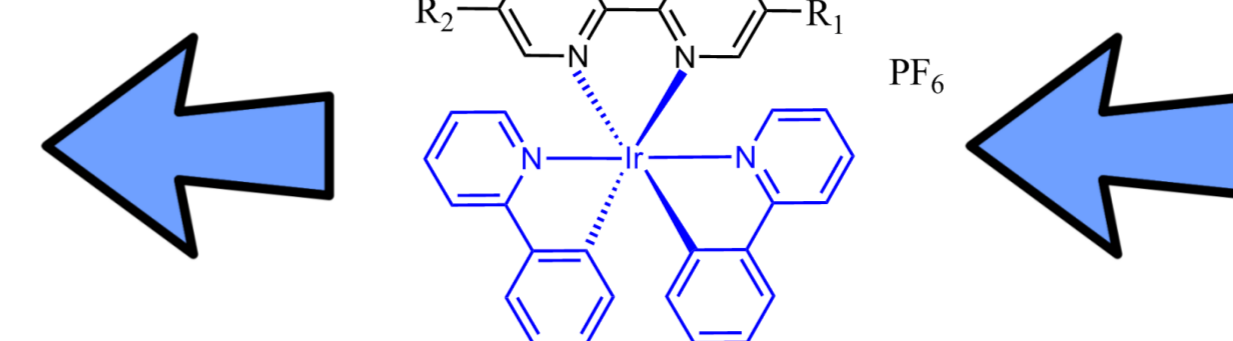
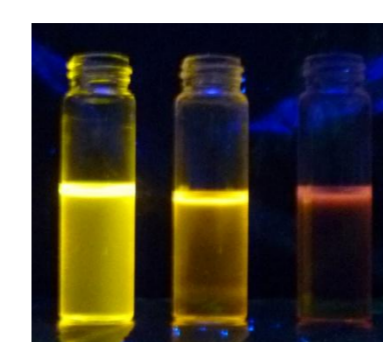
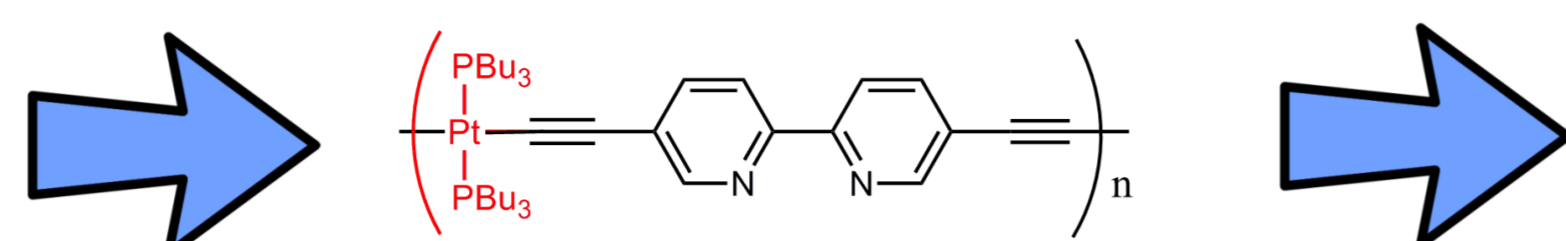




Hybrid Charged Heterometallic Pt Ir Complexes



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Introduction:

Electroluminescent devices based on metal complexes of Pt and Ir will be of considerable interest. They possess high quantum efficiencies (QE). The strong spin-orbit coupling of these heavy metal ions results in intersystem crossing from singlet to triplet excited state, allowing the complexes to utilize both singlet and triplet excitons. These complexes can emit over a wide range of wavelengths, thus enabling the fabrication of organic light-emitting devices (OLEDs) in a range of colors, including white.

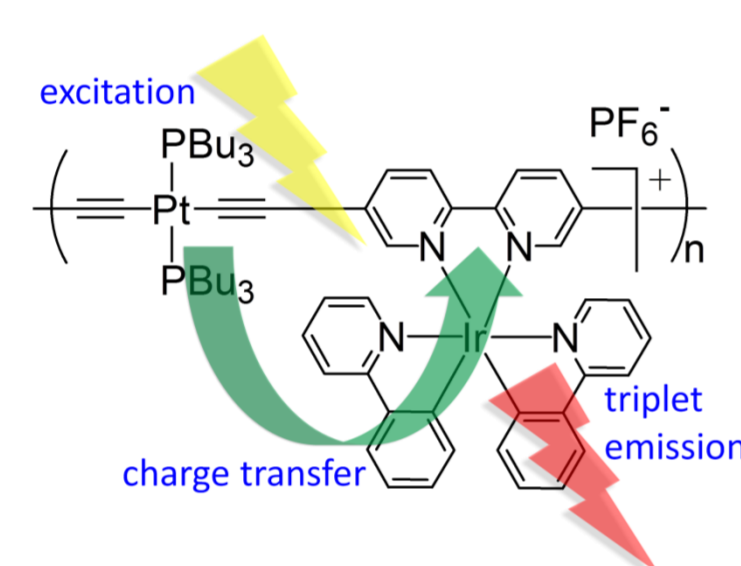
Efficient white light devices are of particular interest, as they may be useful in a wide range of applications from backlight for displays in portable devices to broad area illumination sources for room lighting.

Binding a strongly luminescent fragment onto the bipyridine unit such as an iridium(III) complex with the donor unit *trans*-bis(ethynyl)bis(phosphine)platinum(II) is our scope of study. This configuration helps to keep the conjugation between them high in order to enable the charge transfer behaviour and even tailor an hybrid excited state of the two moieties.

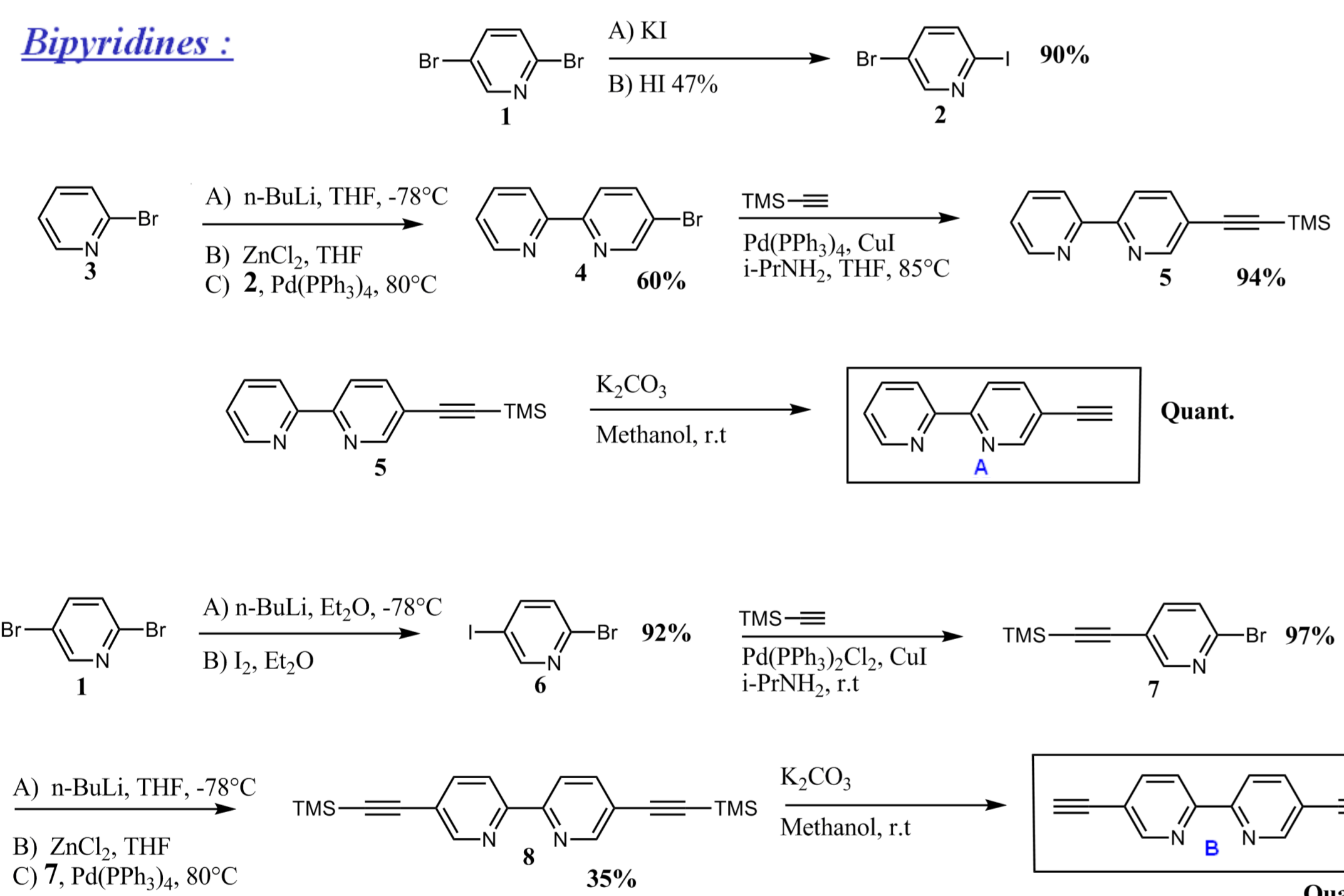
Project objective:

The goal of this work is to prepare new hybrid polymers containing Ir and Pt units (Scheme 1). In order to understand the photophysical behavior of this new polymer, monomers with different Pt and Ir structures has been synthesized. The comparison of the photophysical properties, coupled to MO representations have been studied. These complexes are designed to obtain high performance luminophores for WPOLED (White Polymer Organic Light Emitting Diode) applications.

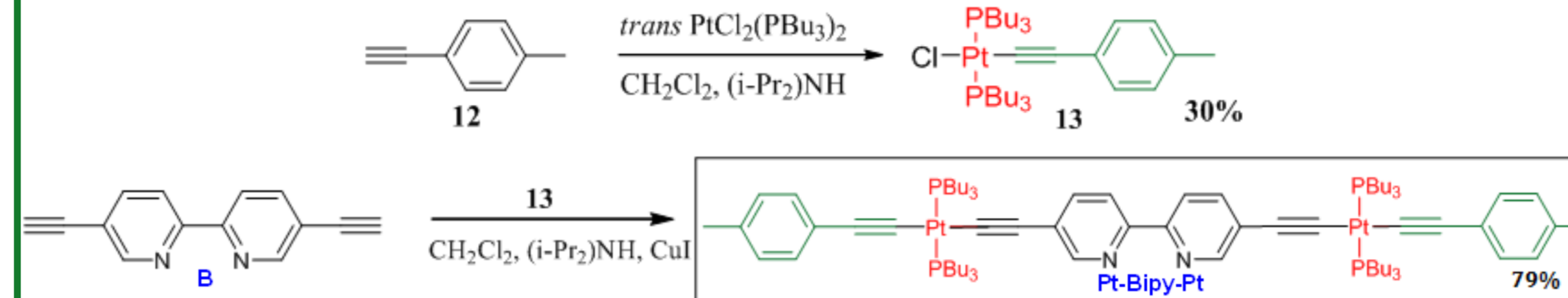
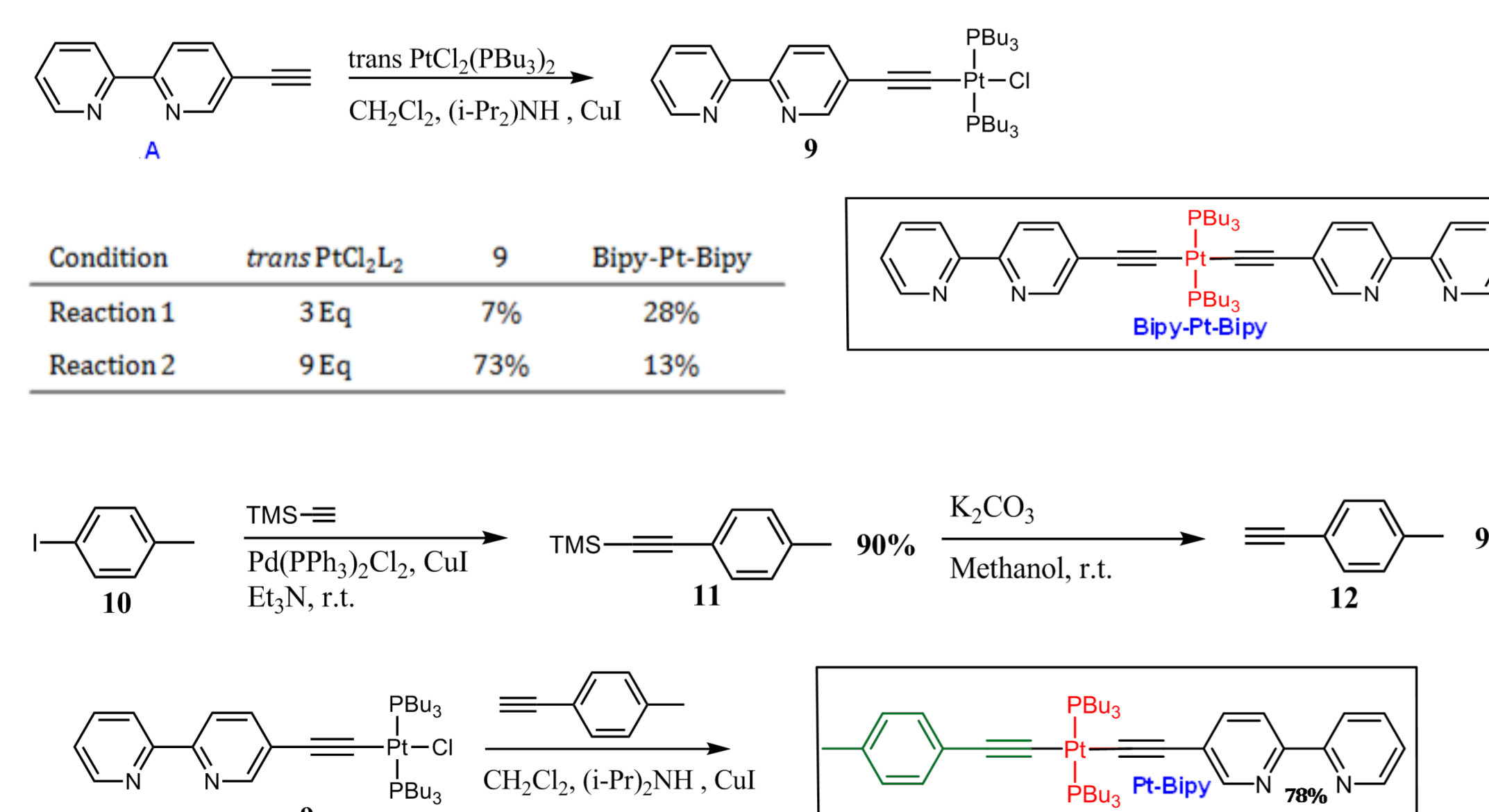
Scheme 1: Target Ir-Pt polymer:



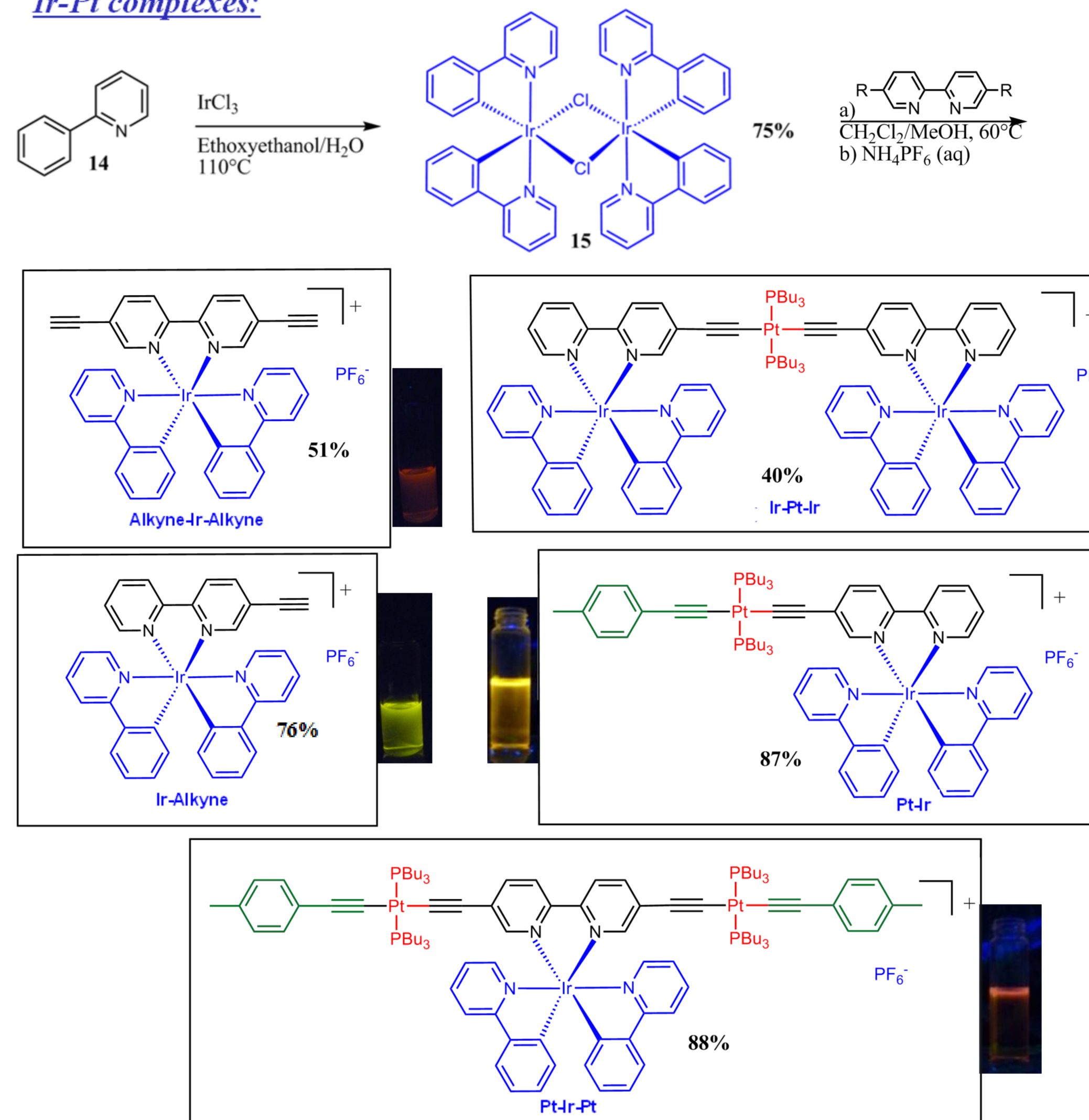
Bipyridines:



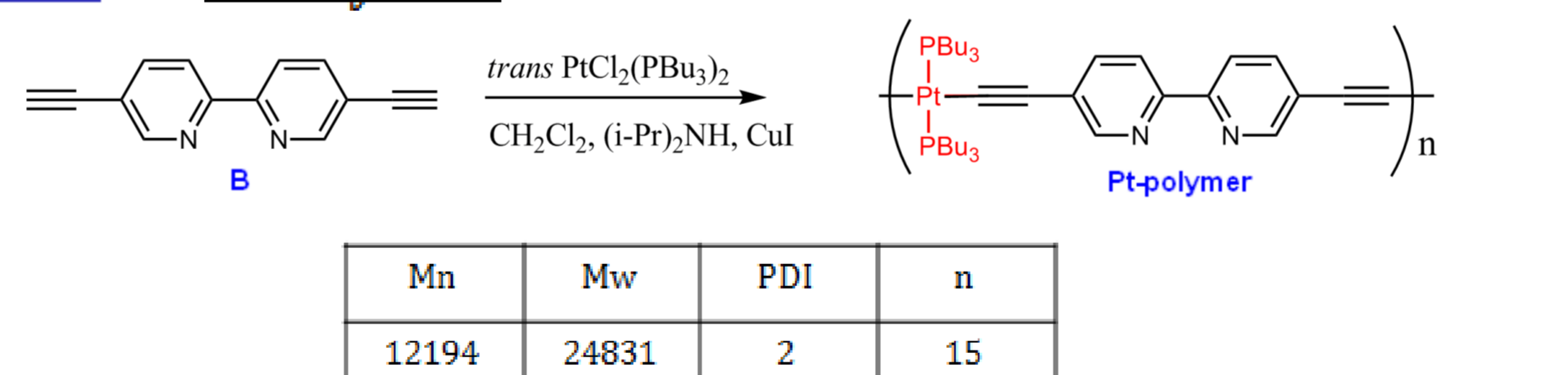
Pt-containing complexes:



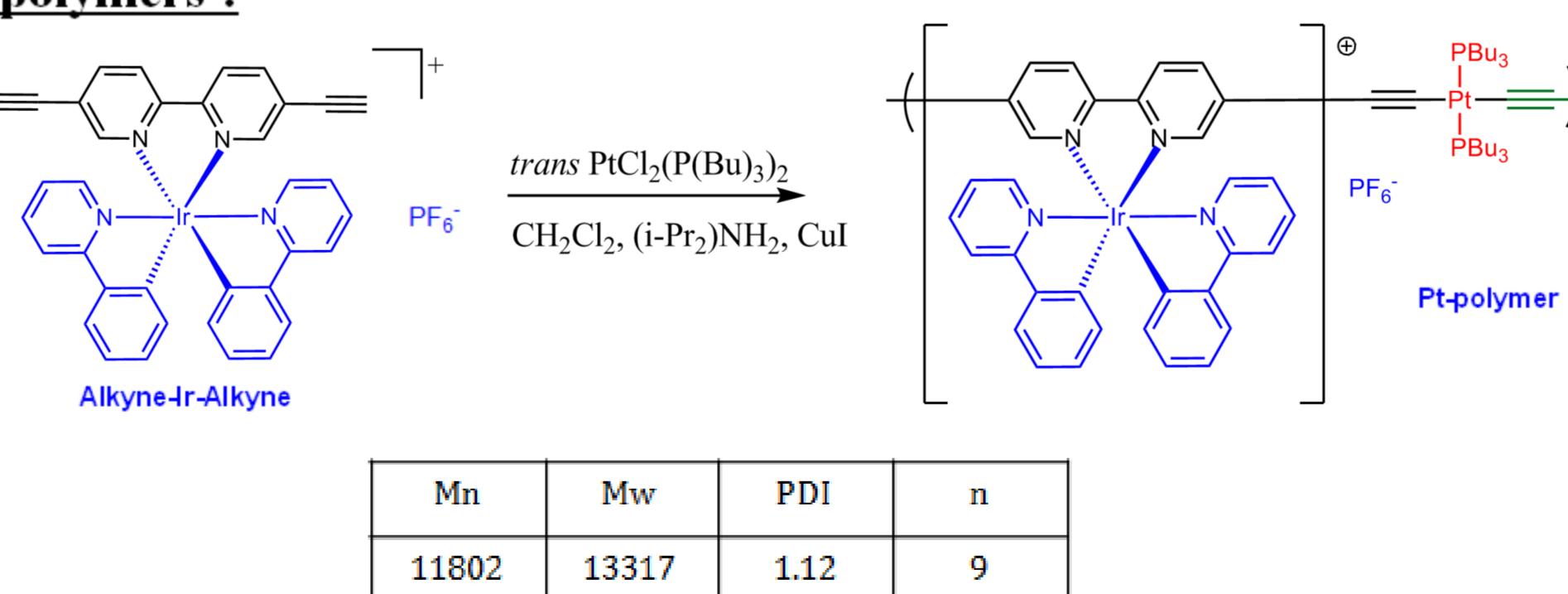
Ir-Pt complexes:



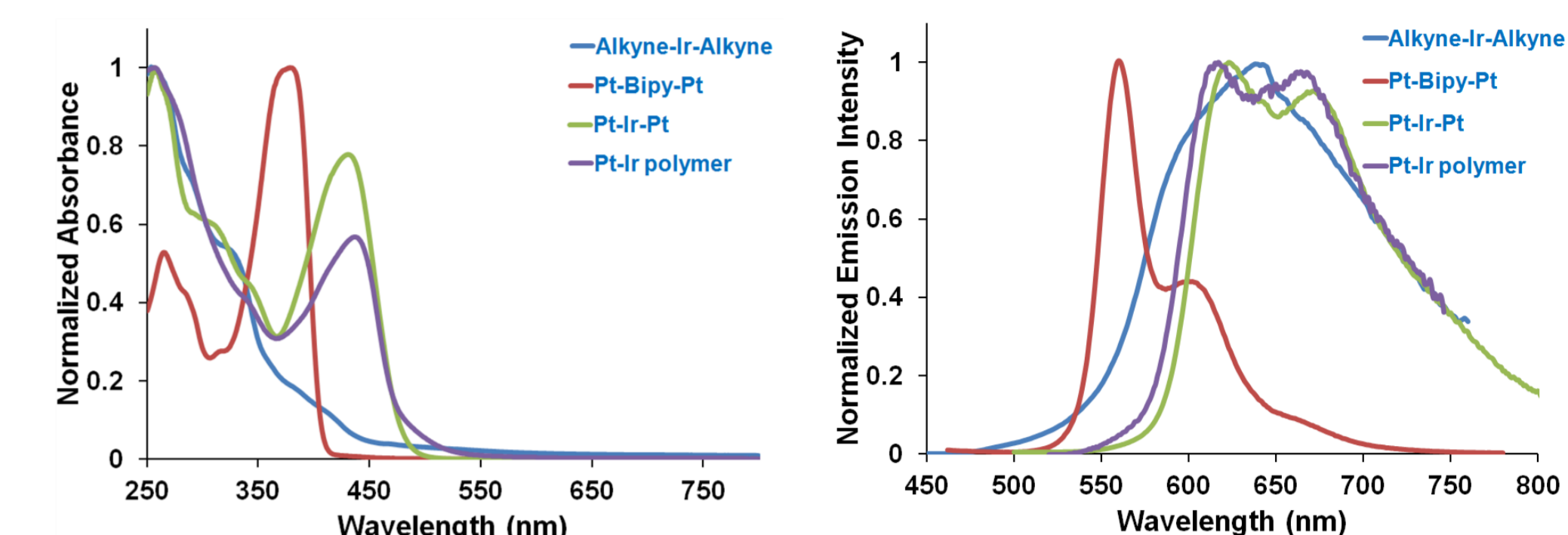
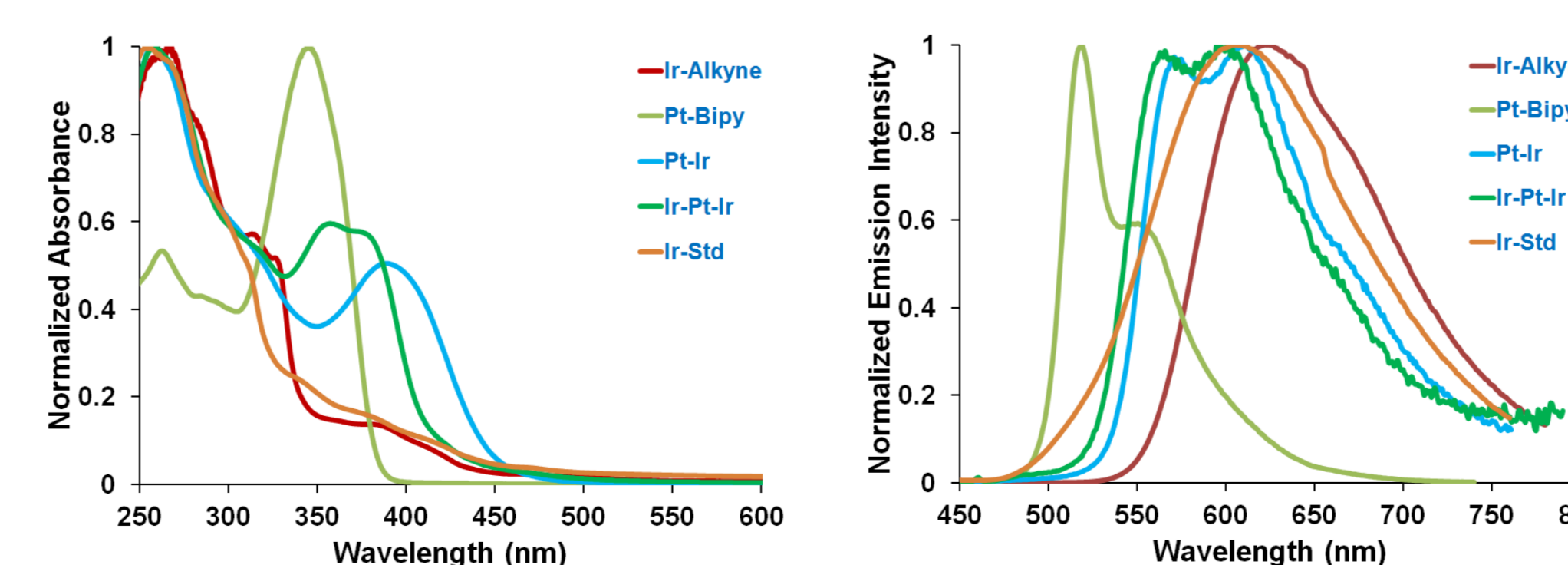
Polymers: Pt-Polymer:



Pt-Ir polymers:



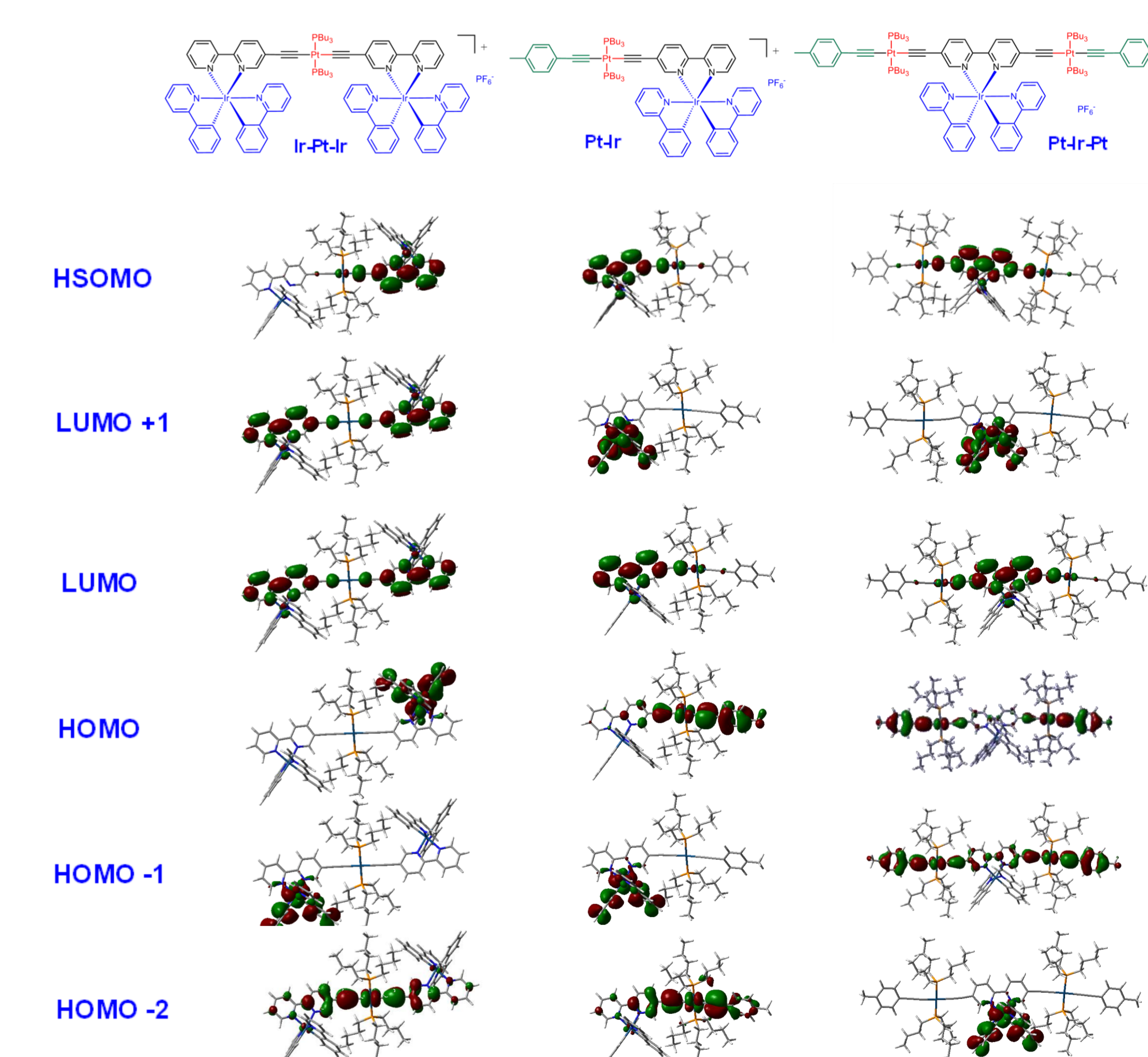
Absorption and emissions:



Photophysics table:

Complex	Absorbance 298 K (nm)				Phosphorescence		Q.Y. (%) ^a	Lifetime	
	[Molar Absorptivities (x10 ⁴ M ⁻¹ cm ⁻¹)]				77 K (nm)	298 K (nm)		77 K (μs)	298 K (μs)
Bipy-Pt-Bipy	250 [1.8]; 265 [1.4]; 300 [2.1]; 350 [6.0]	522	516	14.4	150	33.8			
Pt-Bipy	240 [1.7]; 260 [2.4]; 280 [2.0]; 345 [4.7]	517	519	12.5	155	33.6			
Pt-Bipy-Pt	265 [4.1]; 280 [3.5]; 305 [2.0]; 370 [7.7]	560	560	13.7	153	39.2			
Ir-Std ^b	255 [2.9]; 300 [1.7]; 335 [0.6]; 370 [0.4]; 465 [0.1]	532	607	8.9	5.82	0.55			
Ir-Alkyne	265 [2.3]; 310 [1.0]; 325 [0.9]; 380 [0.2]; 450 [0.1]	536	623	8.5	4.12	0.16			
Alkyne-Ir-Alkyne	250 [4.2]; 280 [3.3]; 315 [2.3]; 370 [0.8]	555	634	1.6	2.65	0.09			
Ir-Pt-Ir	260 [6.8]; 300 [4.1]; 350 [4.0]; 370 [4.0]; 460 [0.2]	547	595	31.9	11.0	2.90			
Pt-Ir	260 [3.6]; 295 [2.00]; 390 [1.9]; 450 [0.2]	549	611	8.3	3.44	0.72			
Pt-Ir-Pt	260 [4.9]; 310 [2.7]; 345 [1.9]; 425 [4.0]	549	620	4.00	4.66	1.33			
Pt-Ir polymer	250 [0.3]; 280 [0.2]; 340 [0.1]; 435 [0.2]	563	615	1.7	5.67	1.22			

MO representations for Ir-Pt-Ir, Pt-Ir and Pt-Ir-Pt complexes:



Conclusions:

The synthesis of the first cationic heterometallic hybrid complexes bearing Ir^{III} and Pt^{II} units is herein reported. The photophysical studies demonstrates that the new complexes exhibit unprecedented hybrid charge transfer emissive excited states of the type [Pt]⁺→[Ir]. Emissions were blue-shifted and lifetimes were longer for the hybrids compared to Ir complexes. Q_{PL} and molar absorptivities for complex ----was noticeably enhanced.

Acknowledgements:

Pr. Zysman-Colman's laboratory team
Pr. Harvey's laboratory team

References:

- 1) Ahmed Moez Soliman, Daniel Fortin, Pierre D. Harvey, * and Eli Zysman-Colman*. *Chem. Commun.*, 2011, Accepted, 1-3. DOI: 10.1039/C1CC15507E
- 2) Ahmed Moez Soliman, Daniel Fortin, Eli Zysman-Colman, * and Pierre D. Harvey*. *Macromol. Rapid Commun.*, 2011, Submitted.