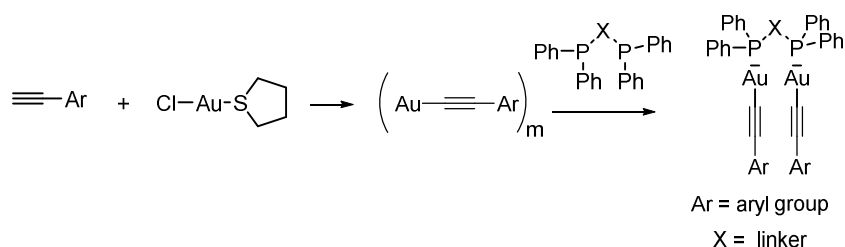


STEPS Students Report

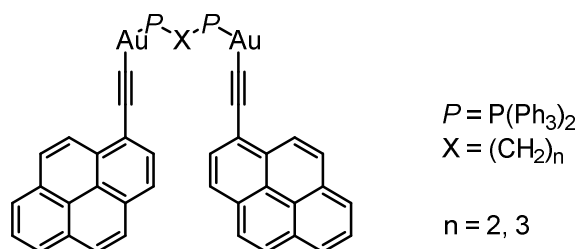
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I spent six weeks in Russia and researched chemistry at Professor Tunik's group. This group's main theme is gold, silver, and copper complexes to display the strong emission for organic EL devices, protein-probes, and so on. My research is the synthesis of binuclear gold(I) phosphine-alkynyl complexes and the investigation of their photophysical properties. The alkynyl ligands that will be used in this work contain the aromatic chromophore. This type of compounds could be synthesized according to scheme below (scheme 1):



Scheme 1. Purpose synthesis of phosphine-alkynyl gold(I) complexes. Several simple structures of these frameworks were already reported by Yam group in *J. Organomet. Chem.* **2003**, *681*, 196–209.

In this research, I designed the Au(I) complexes which contains "pyrene moieties" as ligands for luminophores as shown in Scheme 2.



Scheme 2. Phosphine-alkynyl gold(I) complexes with pyrene I synthesized.

The purpose products were prepared in moderate yield as shown in Scheme 1, and they were characterized by ^1H and ^{31}P NMR. Then, their optical behaviors were investigated utilizing UV-vis absorption and fluorescent measurements. These compounds showed the blue-colored emission in solution state and green-colored

emission in solid state (Figure 1). These luminescence is arising from pyrene moieties; in solution state, they emitted at around 400 nm similar to the emission from pyrene, and in the solid phase they emitted at around 500 nm similar to the excimer emission from pyrene.

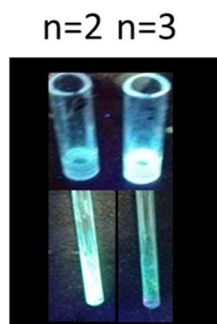


Figure 1. Photograph of luminescent compounds under UV irradiation (365 nm).

In this research, emissive Au(I)–C≡C–aryl complexes with bridging diphosphine linker were developed. This work was reported in the part of the publication “*Dinuclear Diphosphine Complexes of Gold(I) Alkynyls, the Effects of Alkynyl Substituents onto Photophysical Behavior*” in *Z. Anorg. Allg. Chem.* **2018** (DOI: 10.1002/zaac.201700415).

And I also enjoyed the Russian cultures and art, especially ballet. The following photo is Petergof’s palace and Mariinsky theater.

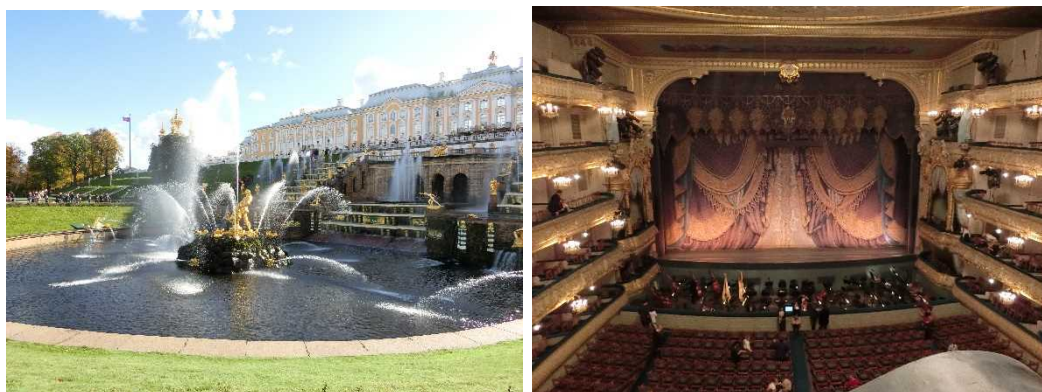


Figure 2. (left) Photograph of Petergof’s palace. (right) Photograph of Mariinsky theater.

So I had a great time in Russia for study chemistry and touch Russian cultures.