

# Quantifying the Detection Limit of Volatile Organic Compounds by Luminescence Using Trinuclear Silver(I) and Copper(I) Pyrazolate

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**Abstract:** Trinuclear silver(I) and copper(I) pyrazolates have the ability to switch-on luminescence in the presence of volatile organic compounds (VOCs) such as benzene, and switch off in the absence of VOCs. These compounds exhibit the potential for use as VOC detectors in industrial settings where high VOC levels are unsafe for workers, and improving the output of organic light emitting diodes. Trinuclear silver(I) and copper(I) pyrazole complexes have been prepared using solvent mediated, air free schlenk technique under different solvents and a green synthetic route involving mechanical grinding. In depth photoluminescence will be studied using a PTI QuantaMaster 30 Spectrofluorometer with a Kin-Tek gas flow generator attached to observe the response of 1 - 10 ppm of benzene exposure while under room temperature and liquid nitrogen.

## Introduction

- Ag(I) complexes have in recent years attracted great consideration as promising luminescent materials. Ag(I) complexes have diverse structural features, interesting phosphorescent properties, low costs, as well as potential applications in OLEDs, photosensitizers, biological imaging, dye-sensitized solar cells (DSCs), and sensing devices.
- The Kin-Tek gas flow generator allows us to control the concentration of the benzene introduced to the sample to better understand the detection limit of the silver (I) trimer.

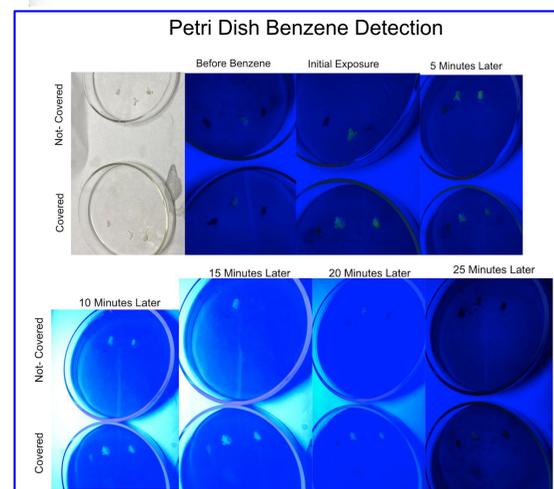
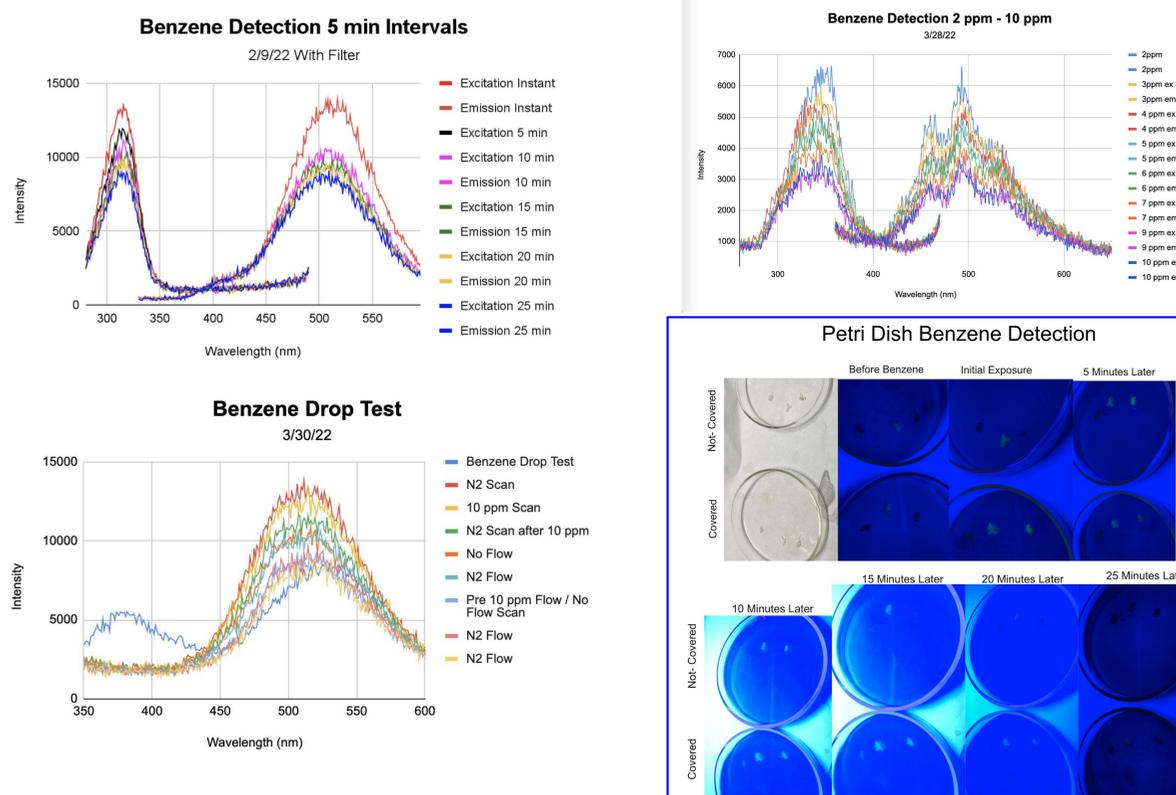
## Methods

- Created a thin film of silver (I) trimer on one end of the rounded cuvette with DCM. Once the thin film was dried a drop of benzene solvent was added to the other side of the rounded cuvette and the luminescence was recorded.
- The Kin-Tek provides the flexibility to flow in different concentrations of benzene. The luminescence was observed at concentrations ranging from 2 ppm to 10 ppm.
- The compound's ability to luminesce on and off in the presence of benzene was observed using open and closed petri dishes.

## Instrumentation & Set-Up



## Results



## Conclusion

- Upon initial exposure, the silver (I) trimer becomes saturated due to the benzene exposure. When flowing only nitrogen gas, there was an increase in intensity due to some evaporation of the benzene vapor.
- The spectrofluorometer showed a decrease in the intensity of the luminescence scans as the presence of benzene reduced.
- Further investigation includes studying the detection limit of the VOCs.

## References

Rawashdeh-Omary, Manal A. "On/off luminescence vapochromic selective sensing of benzene and its 1 methylated derivatives by a trinuclear silver(I) pyrazolate sensor." *Inorganic Chemistry* (2010).

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