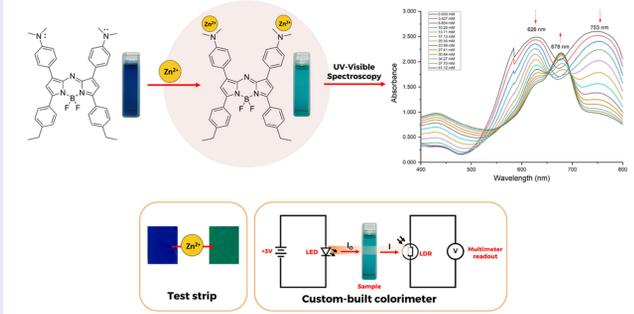
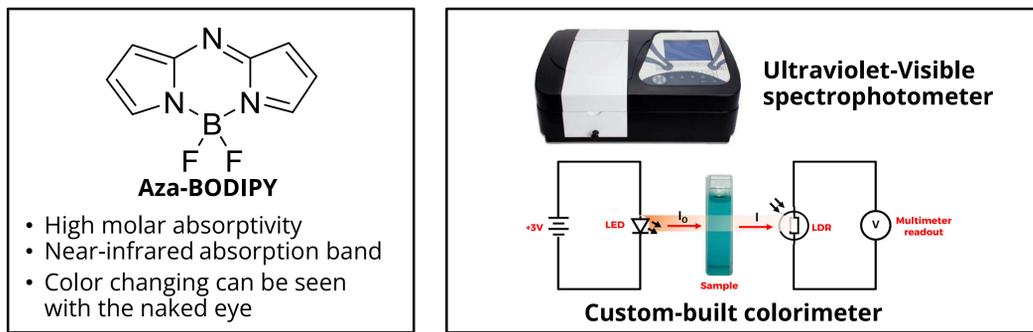
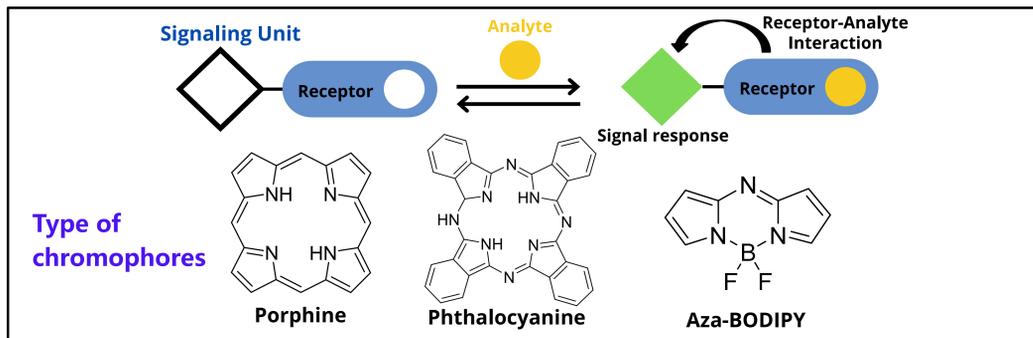


ABSTRACT

An aza-borondipyrromethene (aza-BODIPY) **PO4** was synthesized and studied for chemosensor properties for selective ion detection. The **PO4** bearing two dimethylaniline moieties selectively bind with Zn^{2+} in solution phase. Spectroscopic properties and binding abilities of **PO4** with Zn^{2+} were investigated via spectroscopic titration by gradual addition of zinc chloride into the **PO4** solution. The new absorption band appeared and the color changing of **PO4** had occurred due to the Zn^{2+} inhibited charge transfer of dimethylaniline with aza-BODIPY core. Moreover, hypothesis verification is done through ultraviolet-visible spectroscopy, 1H -nuclear magnetic resonance, and Fourier transform infrared spectroscopy. In addition to chemosensor study using spectroscopic method, the custom-built colorimeter was also used and the results from two methods were compared. The limit of detection (LOD) values of spectroscopic technique and colorimeter were found to be 0.266 mM and 0.427 mM, respectively. The **PO4** as colorimetric sensor for the detection and analysis of Zn^{2+} by the custom-built colorimeter was demonstrated.



INTRODUCTION



RESULTS AND DISCUSSION

Spectroscopic properties

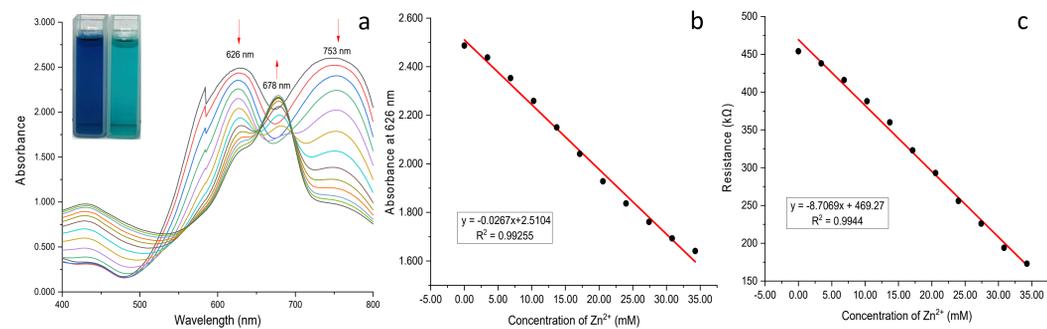


Fig 3. (a) UV-Visible spectra of the **PO4** titrated with Zn^{2+} (b) The calibration graph between $[Zn^{2+}]$ and absorbance (λ_{626}) (c) The calibration graph between $[Zn^{2+}]$ and resistance (k Ω)

- The detection limit of the **PO4** for sensing Zn^{2+} via UV-Visible spectrophotometer is 0.266 mM and via custom-built colorimeter is 0.427 mM.

Characterization

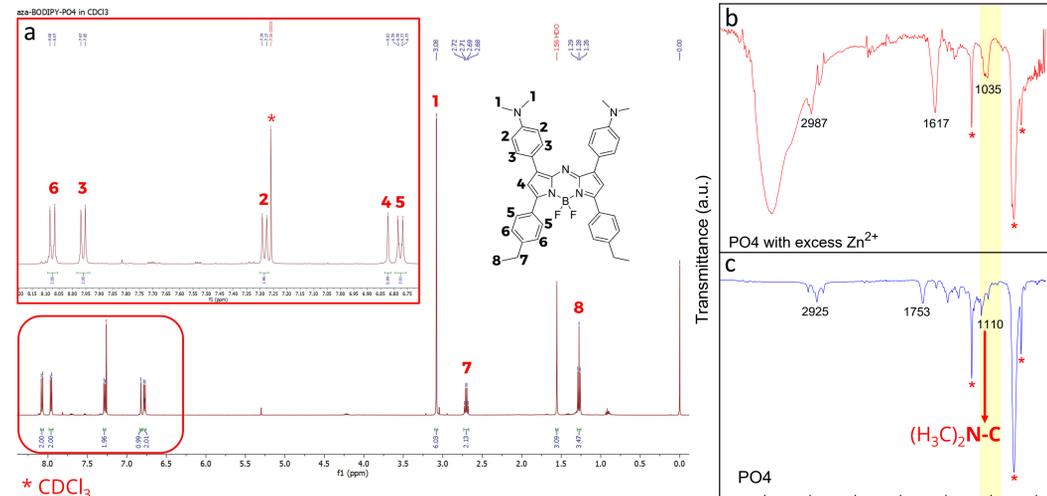


Fig 4. (a) 1H -NMR spectrum of **PO4** in $CDCl_3$ (b) FTIR-ATR spectrum of **PO4** with excess Zn^{2+} (c) FTIR-ATR spectrum of **PO4**

- 1H -NMR spectrum shows a single proton signal in part of the aza-BODIPY core at 6.28 ppm, an ethyl part at 1.28-2.70 ppm, dimethylaniline at 3.08 ppm and an aromatic signals around 6.78-8.07 ppm.
- FTIR spectra show the C-N stretching of dimethylamino group change from ~ 1100 cm^{-1} to ~ 1035 cm^{-1} because of the addition of Zn^{2+} which binds to nitrogen atom. Thus, the C-N stretching frequency decreases.

CONCLUSIONS

- The **PO4** was synthesized and purified by column chromatography.
- 1H -NMR could verify and confirm a symmetric structure of **PO4** and show characteristic signals of the aza-BODIPY core at 6.28 ppm.
- The **PO4** selectively interacted with Zn^{2+} by color changing of the **PO4** from blue to green.
- The **PO4** quantitatively detect of Zn^{2+} using UV-Visible spectrophotometer and custom-built colorimeter with limit of detection values of 0.266 and 0.427 mM, respectively.

ACKNOWLEDGEMENTS

I would like to express my special thanks to the Department of Chemistry, Faculty of Science, Chiang Mai University for the opportunity and financial support. Further, I would like to extend my gratitude to Asst. Prof. Dr.Kullapa Chanawanno and Ms. Sasipan Luangphai for their able guidance and support in completing my project.

REFERENCE

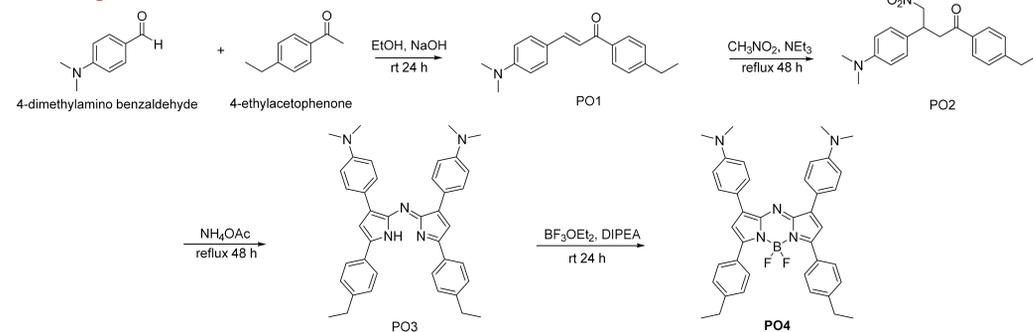
Luangphai, S., Thuptimdang, P., Buddhiranon, S., & Chanawanno, K. (2024). Aza-BODIPY-based logic gate chemosensors and their applications. *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, 322, 124806.

RESEARCH OBJECTIVES

- To synthesize and characterize aza-BODIPY compound (**PO4**)
- To study for chemosensor properties for Zn^{2+} detection and quantitatively analysis of Zn^{2+} via ultraviolet-visible spectrophotometer and custom-built colorimeter

METHODOLOGY

Synthesis of aza-BODIPY (**PO4**)



Characterization

- 1H -NMR
- FT-IR

Spectroscopic properties

- UV-Visible spectroscopy
- Custom-built colorimeter

Chemosensor properties

- Selectivity test
- Test strip

RESULTS AND DISCUSSION

Chemosensor properties

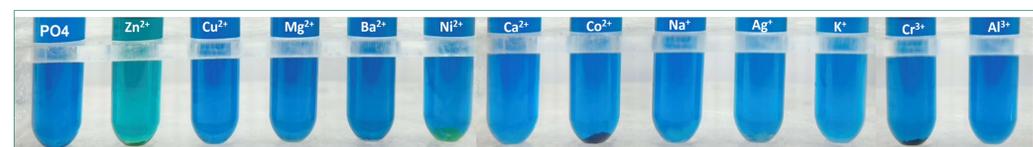


Fig 1. Selectivity test for **PO4** with metal ions



Fig 2. (a) **PO4** embedded on TLC strip (b) **PO4**+ Zn^{2+} (DI water) (c) **PO4**+Ang Tat Chomphu water (d) **PO4**+ Zn^{2+} in Ang Tat Chomphu water (e) **PO4**+ Zn^{2+} (Ang Tat Chomphu water)

- The selectivity test and test strip show that the **PO4** colors changed from light blue to blue-green and blue to green when it interacted with Zn^{2+} .