【系所領航】陳志欣師生團隊 連續兩篇論文刊登國際重要期刊

【記者陳宇暄淡水校園報導】化學系系主任陳志欣與學生共同發表兩份論文，分別為博士後研究Rajib Nandi與專題生化學四莊詠蓉，發表「Liquid crystal sensor for Cr(III)–citrate detection via interfacial coagulation（可檢測水中檸檬酸鉻含量之液晶感測器）」，刊登於《Analytica Chimica Acta》，影響因子達5.7；另陳志欣指導碩士生張文豪發表「Cyano–substituted Bis((benzothiophen–2–yl)pyridine) (acetylacetonate) iridium complexes for efficient and stable deep red organic light–emitting diodes emitting at 673 nm（氰基取代的銥錯合物（Ir(btpCN)□(acac)），能發出波長達 673 奈米的深紅光）」，刊登於國際期刊《Dyes and Pigments》影響因子達4.1，皆為該科學研究領域Q1期刊。

Rajib Nandi與莊詠蓉開發此感測器，是利用特殊磷□離子材料（THPB）摻入液晶中，當檢測到有毒的Cr(III)–citrate 時，液晶會從暗場變為亮場，實現肉眼可辨識的即時偵測。陳志欣表示，該技術不僅選擇性高、靈敏度達5微莫耳（□M），更可免除昂貴儀器。適合應用於現場水質監測。更為環境中重金屬污染的檢測，提供簡單、快速、有效的新工具，具有實際應用潛力。

已考上清華大學分析與環境科學研究所的莊詠蓉，指出未來希望整合學長姐已開發的其他金屬離子檢測技術，共同設計出具多重分析能力的液晶感測器。「藉由搭配不同探針分子，將有機會實現單一元件對多種待測物的檢測。」

現已畢業的張文豪則說明，開發此新型深紅光有機發光材料，具備優異的發光效率與穩定性，所製作的OLED元件，不僅達到外部量子效率（EQE）10.2%，更在200 cd/m□的亮度下，達成190 小時的壽命，為目前文獻中深紅光OLED的最佳表現之一。他指出：「這類深紅光材料，不僅適合應用於高端顯示器與近紅外感測，更具潛力延伸至光動力療法等生醫治療用途。」且該材料合成簡單，亦有望應用於農業照明及顯示技術等領域，展現我國在有機光電材料開發上的創新實力。


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Liquid Crystal based Sensor for Detection of Chromium (III)-citrate complexes in water
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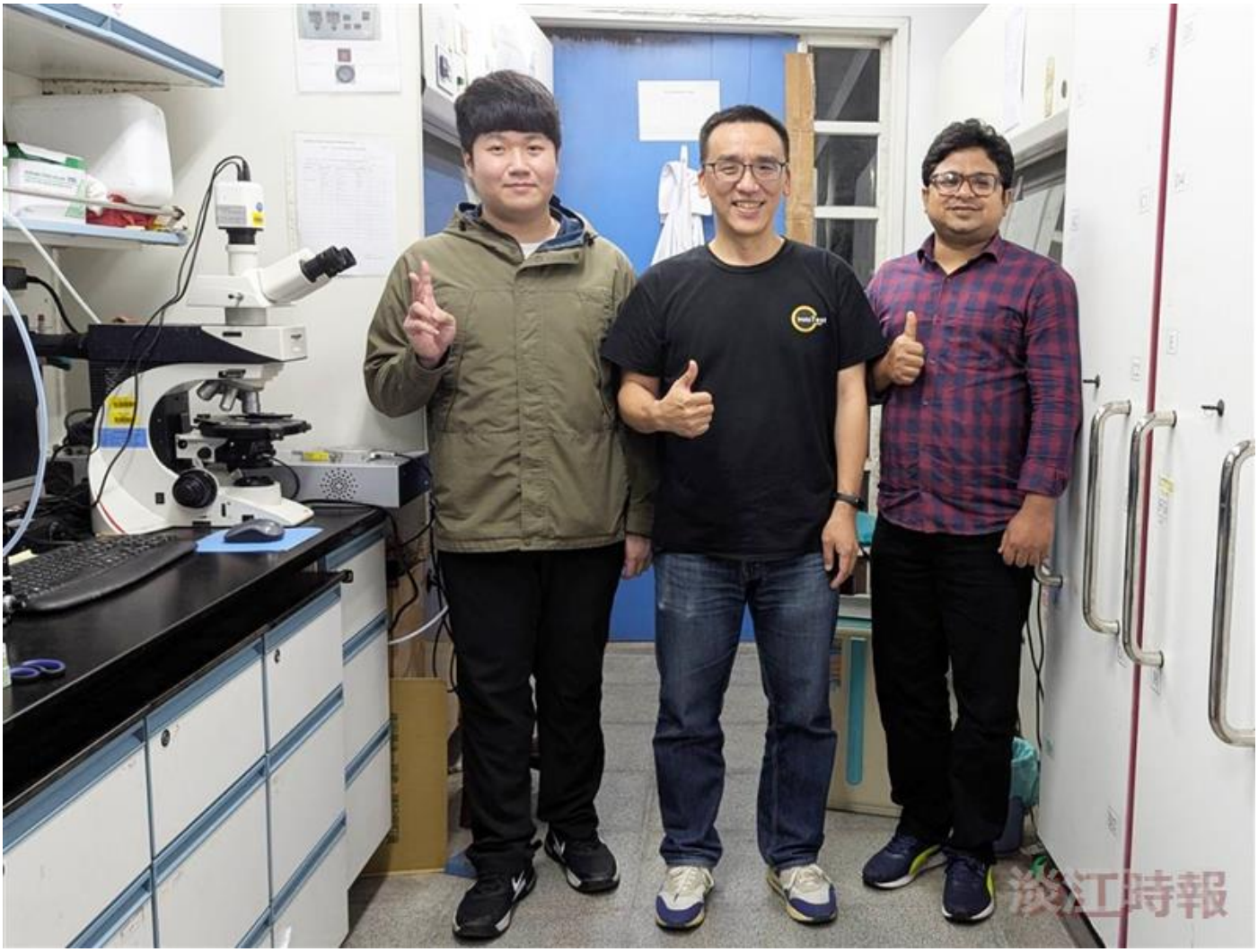
淡江時報

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Liquid crystal sensor for Cr(III)-citrate detection via interfacial coagulation

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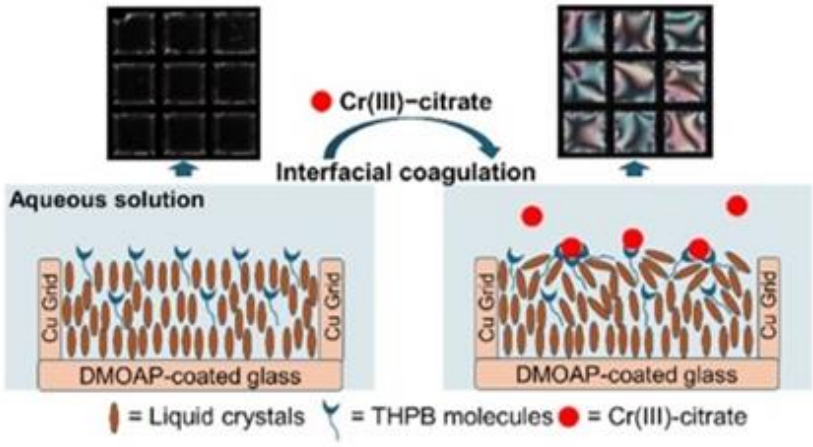
HIGHLIGHTS

- Developed a novel LC-based sensor for detecting Cr(III)-citrate in water.
- THPB-doped LC shows dark-to-bright optical response specific to Cr(III)-citrate.
- Sensor achieves high selectivity over other metal ions and metal-citrate complexes.
- Detection limit of 5 μM, below regulatory limits for industrial discharge.
- Demonstrates the potential of LC sensors for environmental monitoring of metal ions.

GRAPHICAL ABSTRACT

Liquid crystal-based optical sensor for detection of Cr(III)-citrate in water.



ARTICLE INFO

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Interfacial coagulation
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Environmental monitoring

ABSTRACT

Background: Trivalent chromium (Cr(III)) and its highly soluble carboxyl complexes, often discharged into the environment by industries such as electroplating, leather tanning, and textile manufacturing, present severe risks to human health and ecosystems due to their high toxicity. These compounds are notoriously difficult to detect and remove during wastewater treatment, as they can persist in aqueous environments. Consequently, there is a pressing need for the development of simple, cost-effective, and reliable methods for their detection, which can improve monitoring, facilitate timely interventions, and enhance environmental protection efforts.

Results: In this study, we developed a liquid crystal (LC)-based sensor for detecting Cr(III)-citrate in aqueous environments. The sensor utilizes the amphiphilic ligand tributylhexadecylphosphonium bromide (THPB), which is strategically doped into the LC matrix. When subjected to polarized optical microscopy, the THPB-doped LC displayed a transition from a dark to a bright optical state specifically in the presence of Cr(III)-citrate, demonstrating high selectivity over other metal ions, anions, chelating groups and metal-citrate complexes. Comprehensive analyses at both bulk and molecular levels demonstrated that this notable optical transition is facilitated by strong electrostatic interactions between THPB and Cr(III)-citrate, resulting in interfacial

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Cyano-substituted Bis((benzothiophen-2-yl)pyridine) (acetylacetonate) iridium complexes for efficient and stable deep red organic light-emitting diodes emitting at 673 nm

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ABSTRACT

This study explores the development of cyano-substituted bis((benzothiophen-2-yl)pyridine) (acetylacetonate) iridium complexes, specifically $Ir(btpCN)_2(acac)$, for use in efficient and stable deep red organic light-emitting diodes (OLEDs) emitting at 673 nm. The new emitter, $Ir(btpCN)_2(acac)$, was designed to achieve red-shifted emission through strategic cyano substitution at the meta-position of pyridine moiety of btp ligand, leveraging the favorable overlap between its emission spectrum and the absorption spectrum of the exciplex host composed of BCzPh and CN-T2T. The OLED devices employing $Ir(btpCN)_2(acac)$ as the emitter exhibited a peak external quantum efficiency (EQE) of 10.2 % and an emission wavelength of 673 nm. Significantly, these devices demonstrated superior operational stability, with a lifetime (LT_{50}) of 190.8 h at an initial luminance of 200 cd m^{-2}, which is among the highest reported for deep-red OLEDs in the literature. This remarkable stability is achieved without compromising the device performance, making $Ir(btpCN)_2(acac)$ a highly promising candidate for commercial applications. In addition, the straightforward synthesis process of $Ir(btpCN)_2(acac)$ further enhances its potential for widespread use. Overall, our findings highlight the potential of cyano-substituted Ir complexes for creating efficient, stable, and commercially viable deep-red OLEDs. The balanced performance of $Ir(btpCN)_2(acac)$ in terms of efficiency, stability, and ease of synthesis marks a significant advancement in the development of OLED technology suitable for phototherapy and other applications requiring reliable deep-red light sources.