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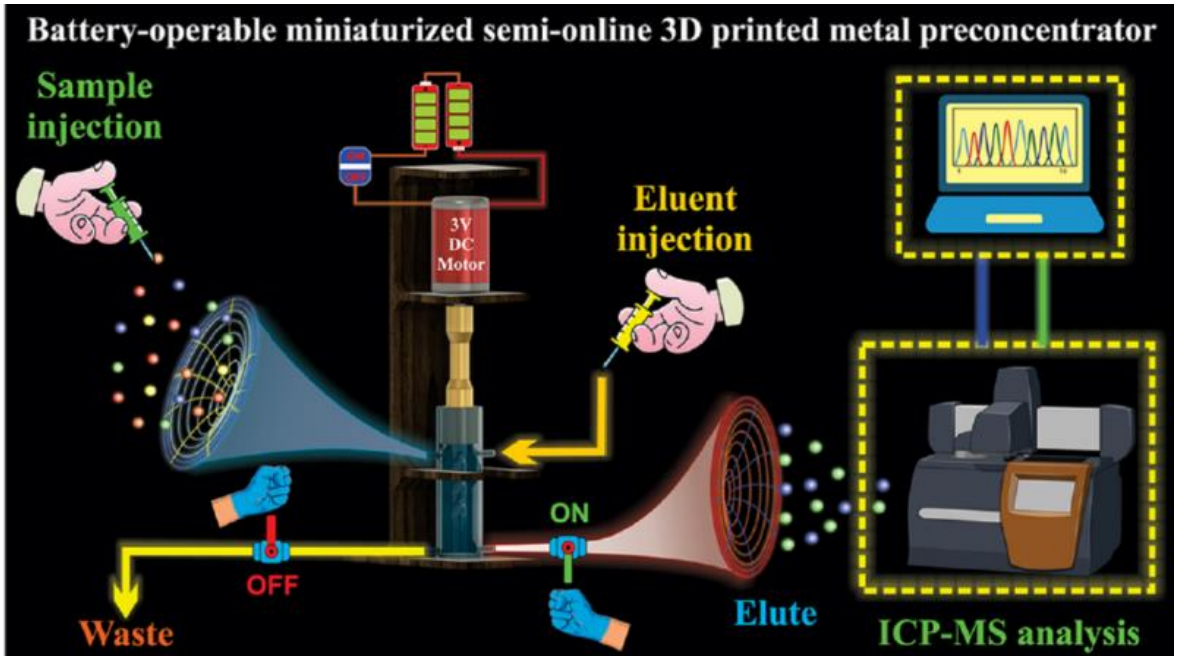
研究團隊主要研究包括利用各種微分離與三維列印技術結合奈米材料或樣品前處理技術並搭配各類檢測儀器開發分析方法，並拓展應用於各類生物標記物之檢測分析及其生醫與疾病之應用。

利用三維列印技術結合感應耦合電漿質譜法開發可切換式之整合微小化分析平台，除了具有多元素分析的特性之外，也具有全自動線上分析的應用與發展潛力。所完成開發的分析平台具有優異的分析效能，可重複多次使用的特性也展現出具永續與綠色分析的 SDG 特色。此外，新穎且兼具天然成份來源的重金屬吸附材料近來受到廣泛的關注與研究，製作微小化三維列印手動之新穎樣品前處理裝置搭配可置換的幾丁醣/聚多巴胺薄膜，我們成功地開發出新穎的分析平台於重金屬的檢測面向獲得優化的成果並應用於生醫樣品的檢測與分析。再者，鑒於奈米科技結合生物材料在分析檢驗領域的蓬勃進展，



我們自組裝幾丁醣/聚多巴胺奈米粒子成為具有吸附能力的吸附圓珠並結合高效能液相層析技術成功地建置多功能的分析平台，並應用於各類樣品基質中抗生素的檢測與分析。

【研究團隊】

團隊成員：Emmanuvel Arputharaj、Shivangi Singh, Mudigonda Sunaina, Kainat Ishaq、黃友利

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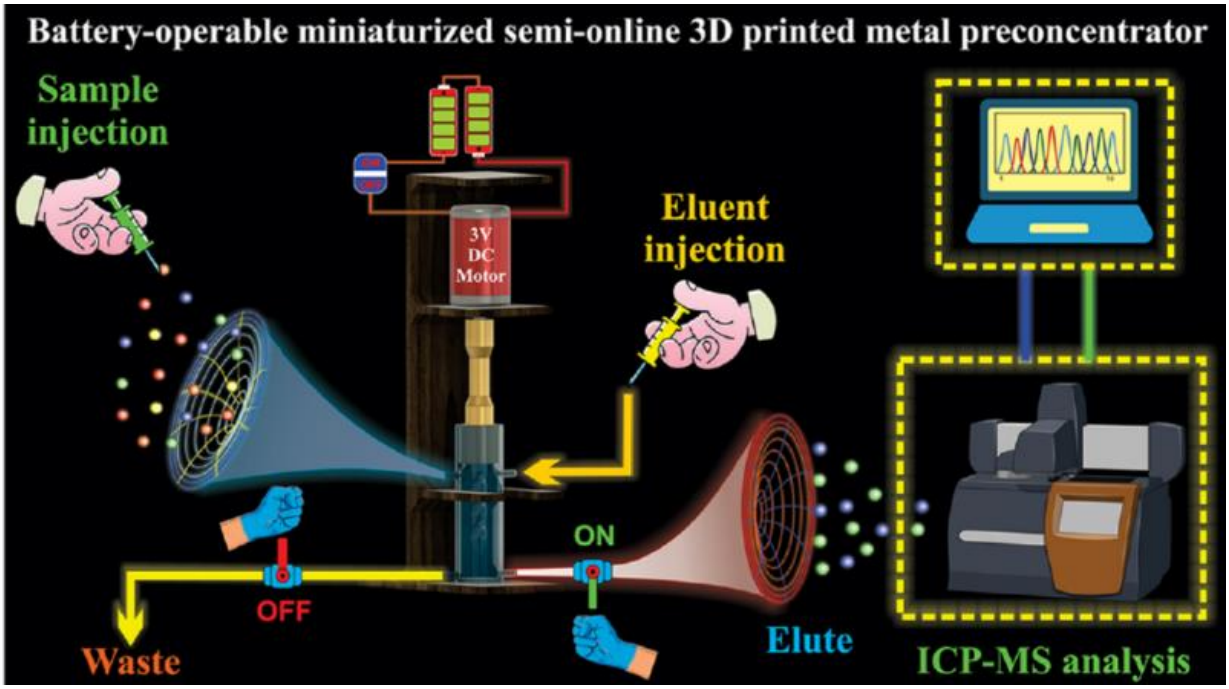
To address the increasing demand for sensitive and selective sample preparation methods for metal analysis; preconcentration of intended analyte from complex sample matrices before analysis is required to improve the performance of analysis instruments. In our research, we have engineered a sustainable and portable syringe-based hand-operable three-dimensionally (3D) printed sample pretreatment apparatus equipped with a replaceable bio-based thin- film metal sorbent. In addition, we have fabricated a replaceable 3D-printed PLA metal extractant (FNC@3D PLA) by functionalizing the 3D-printed PLA surface with active functional group–rich nanocomposite material (MPTMS-Thiol-gCN NSs) and integrated it into a lab-developed miniaturized 3D-printed metal separation column setup. The study significantly contributes to the advancement of analytical methodologies by providing a reliable and efficient platform for metal extraction and preconcentration in practical metal analysis applications. Developed FNC@3D PLA system demonstrates its potential to address the challenges associated with SPE in metal analysis, especially in complex sample matrices. We believe implications of this research can be extended to various fields, from environmental monitoring to clinical diagnostics, where accurate and reliable metal analysis is paramount. Furthermore, a paradigm shift in sample pretreatment methodologies for antibiotics analysis and envisions CS/Fe@PDA beads as a valuable tool was developed for further advancements in separation science. The proposed bio-sorbent introduced a promising avenue for optimizing antibiotics analysis, contributing to broader goals of food safety and pharmaceutical quality assurance.



【Research Team】

Team Members: Emmanuvel Arputharaj、Shivangi Singh, Mudigonda Sunaina, Kainat Ishaq, Yeou-Lih Huang

Research Team Introduction:

Current research in our laboratory focuses on the development of novel microanalytical systems for trace element speciation, miniaturized sample

pretreatment systems, mass spectrometric techniques, and the relationships between trace elements, biomarkers and diseases.

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