Chemical sensors: An innovative tool for detecting organic pollutants produced in heavy industries

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# ABSTRACT

Persistent organic pollutants (POP) are hazardous chemicals that pose an occupational health risk, bioaccumulate in living organisms/soil, and can travel extensive distances. Polycyclic aromatic hydrocarbons, a collection of POP’s, are notable for their high toxicity to both people and the environment. Many industrial processes involving high temperature combustion or petrol produce polycyclic aromatic hydrocarbons, as a result they are of concern in aluminium smelting, coal mining, and the petroleum industry. Robust environmental monitoring schemes produce valuable information for remediation following contamination events, evaluate the effectiveness of past environmental management techniques, and monitor occupational health risks. Current detection techniques for POP’s are time consuming, costly, and can require extensive sample preparation or skilled operators which inhibit effective and frequent monitoring. Chemical sensors transform chemical information into detectable signals. Typical chemical sensors can detect these analytes with high sensitivity, cost efficiency, and have rapid straight forward usage. However, they often only detect a single analyte, which hinders their utility in industrial scenarios where a range of pollutants are present. This research develops a technique to detect multiple POP’s with the same collection of optical lanthanide chemosensors. I analysed how varying four different POP’s concentrations altered luminescence (light) intensity at 615 nm for three unique europium (III) complexes using a fluorimeter. It aims to develop a unique ‘fingerprint’ for each analyte, through catagorising how they modulate the luminescent signal from the chemosensors array. Ultimately, developing a technique to use the same chemosensor kit to detect multiple analytes and their concentrations would increase utility and decrease costs as less resources would be required. By improving feasibility of testing more frequent monitoring could be conducted to ensure the health and safety of workers, Australia's diverse ecosystem, and local communities.