Recovery of Toxic Metals: Using Robotics to Detect and Recover Metals in Waste-streams

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1 Current Issues in Metal Recovery

Toxic metals are found in waste-streams across multiple industries:

Water Treatment

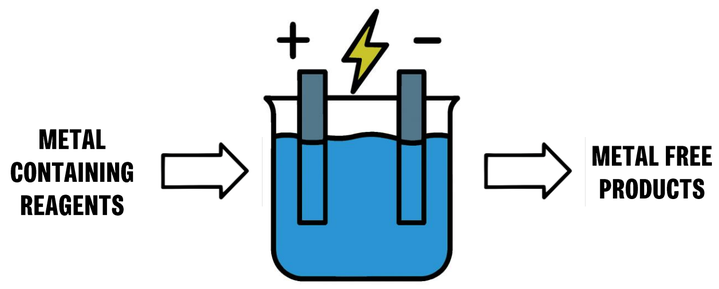
Pharmaceuticals

Mining

Methods to recover metals often require harsh conditions, use toxic chemicals and are energy intensive. However, demand for these metals is increasing as global supplies are dwindling, or are geopolitically inaccessible. Recovering metals for re-use would enable a metal circular economy to be developed.

2 Our Solution for Recovery

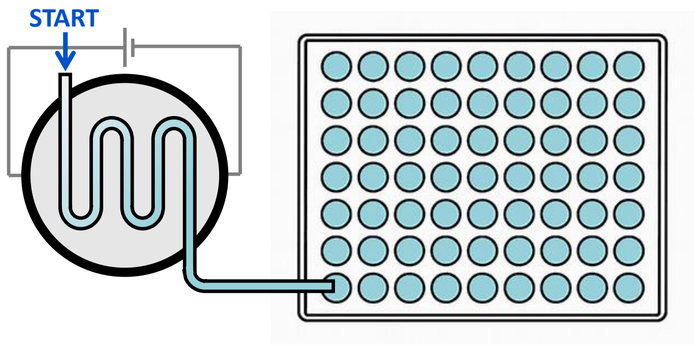
Electrochemistry uses electrons directly in reactions - making reactions more sustainable. We can use it to recover metals from waste-streams.



We have developed a technique to monitor metal recovery using just a camera – called qCAM. Current methods are slow, expensive and need specialist equipment.

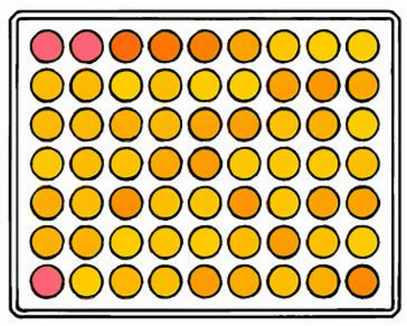
3 Our Approach to Detection

I Waste-streams are passed through a flow electrochemical cell – metal in the waste-stream is recovered



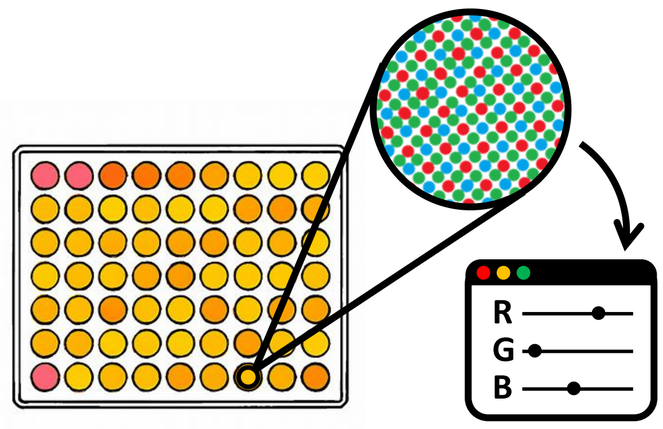
Remaining solution is decanted into a plate

II An indicator solution is added to the reaction mixtures

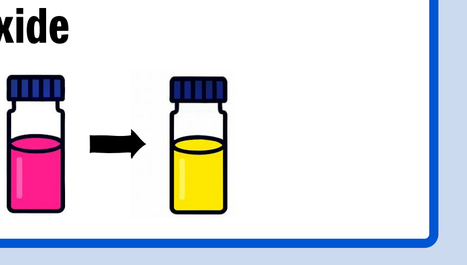


The quantity of metal present in the solution turns the indicator solution different colours.

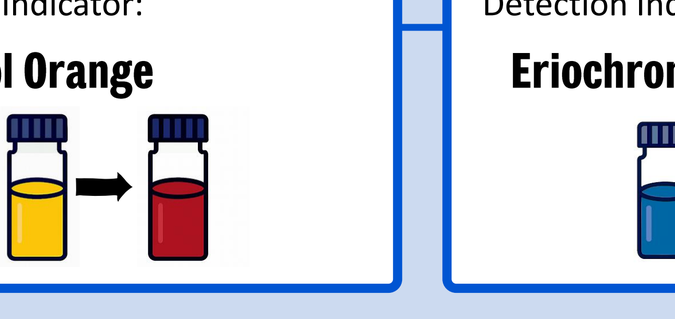
III A camera is used to monitor the colour of reactions and convert to RGB values



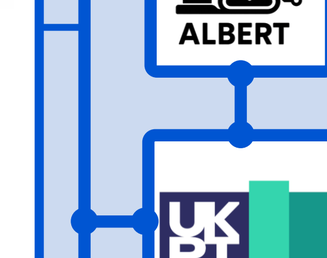
IV All samples are analysed at the click of a button – instantly determining the concentration of metal in any sample



V This technique can be applied to a range of metals across the periodic table



VI The software and hardware are designed to be ***user friendly*** and ***low cost.***



Can be implemented into any existing set-up
Eg: industrial process site

4 Applications

We envisage this technique to be applicable across many scientific disciplines:

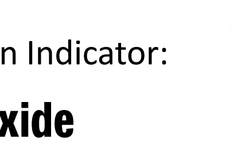
Water Treatment

Contaminant:

Nickel

Detection Indicator:

Murexide



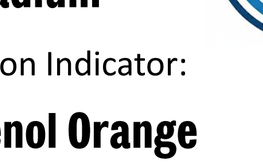
Pharmaceuticals

Contaminant:

Palladium

Detection Indicator:

Xylenol Orange



Mining & Refinery

Contaminant:

Copper

Detection Indicator:

Eriochrome Black T

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