Electronic Supplementary Material (ESI) for Analyst.
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Electronic Supporting Information (ESI)

Experimental

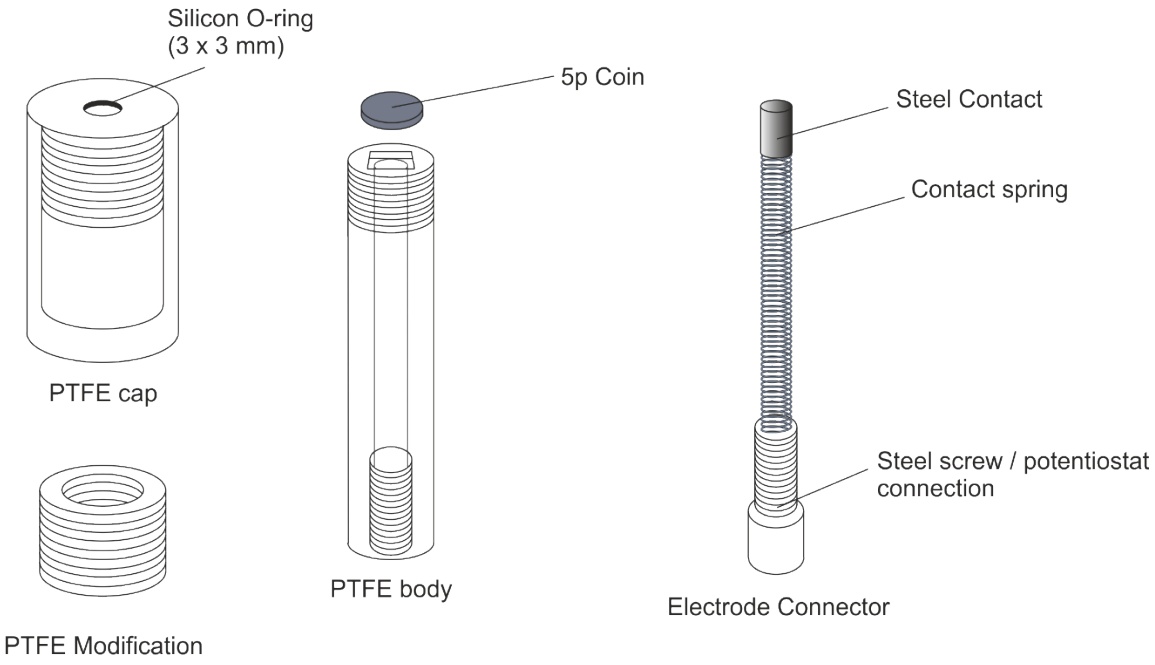
All chemicals used were of analytical grade and used as received without any further purification from Sigma-Aldrich (Gillingham, UK). All solutions were prepared with deionised water of resistively no-less than 18.2 Ω cm. All solutions (unless stated otherwise) were vigorously degassed with nitrogen to remove oxygen prior to analysis.

Voltammetric measurements were carried out using an Áutolab PGSTAT 101' (Metrohm Autolab, The Netherlands) potentiostat – A 5 pence British coin was used as the working electrode along with a platinum wire counter electrode and a Saturated Calomel Electrode (SCE) reference (Radiometer, Copenhagen, Denmark) completing the conventional three electrode electrochemical system. The working electrodes, 5 pence coins as well as nickel sheet metal, were placed into a Polytetrafluoroethylene (PTFE) 'housing' unit which comprised of a PTFE cap (with 3.0 mm bore hole leaving a working electrode area of 7.1 mm^2) and PTFE body allowing easy electrical wiring of the coin (and nickel sheet); see ESI Figure 1 for a schematic representation of the bespoke electrochemical cell. Prior to analysis the 1 pence coin was sonicated in methanol to provide thorough surface cleaning for 2 mins. A new 5 pence coin was utilised for each experiment with each side utilised. Note: as per the Coinage Act 1971; it is currently against UK legislation to melt down or break up any metal coin which is for the time being in circulation, hence the PTFE housing unit is designed to allow the whole coin to be insert and then electrically connected.

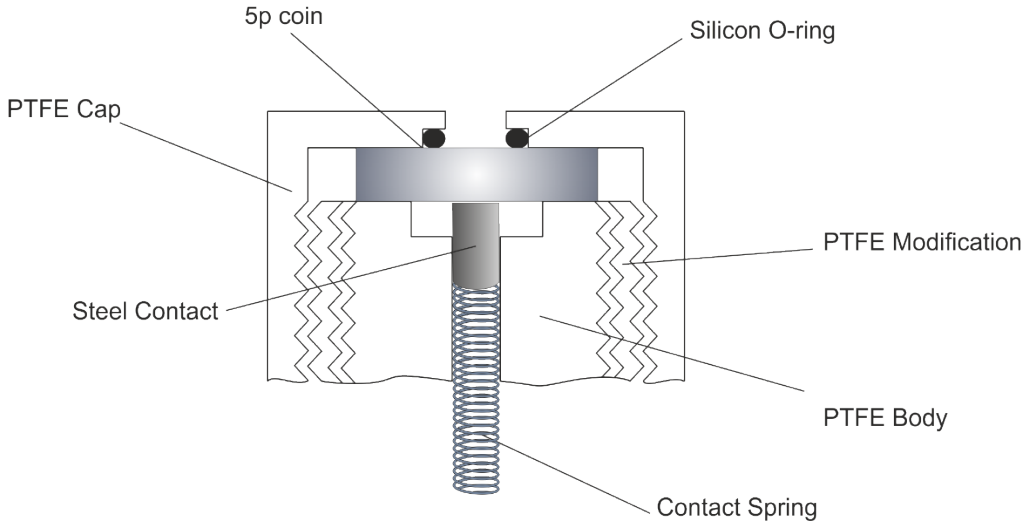
For the detection of lead in pH 4 acetate buffer, a square-wave voltammetry method was used. Potential measurements used a conditioning potential at +1.2V for 0 seconds, deposition potential at -1.2V for 120s a frequency at 50Hz and amplitude at + 0.1V. The potential window extended from -1.2V to +0.2V. Scanning electron microscope (SEM) images and surface element analysis were obtained with a Zeiss Supra 40vp model equipped with an energy-dispersive X-ray microanalysis package (GenesisEdax).

ESI Figure 1 Schematic Diagram of the *Regal Electrochemistry* experimental cell PTFE 'housing' unit used to hold the 5 pence sensor in place for analysis and defines the working electrode area. B: Cross sectional diagram of assembled PTFE 'housing' unit with a retrofitted 5p-sensor in place which is then inserted into the solution under investigation.

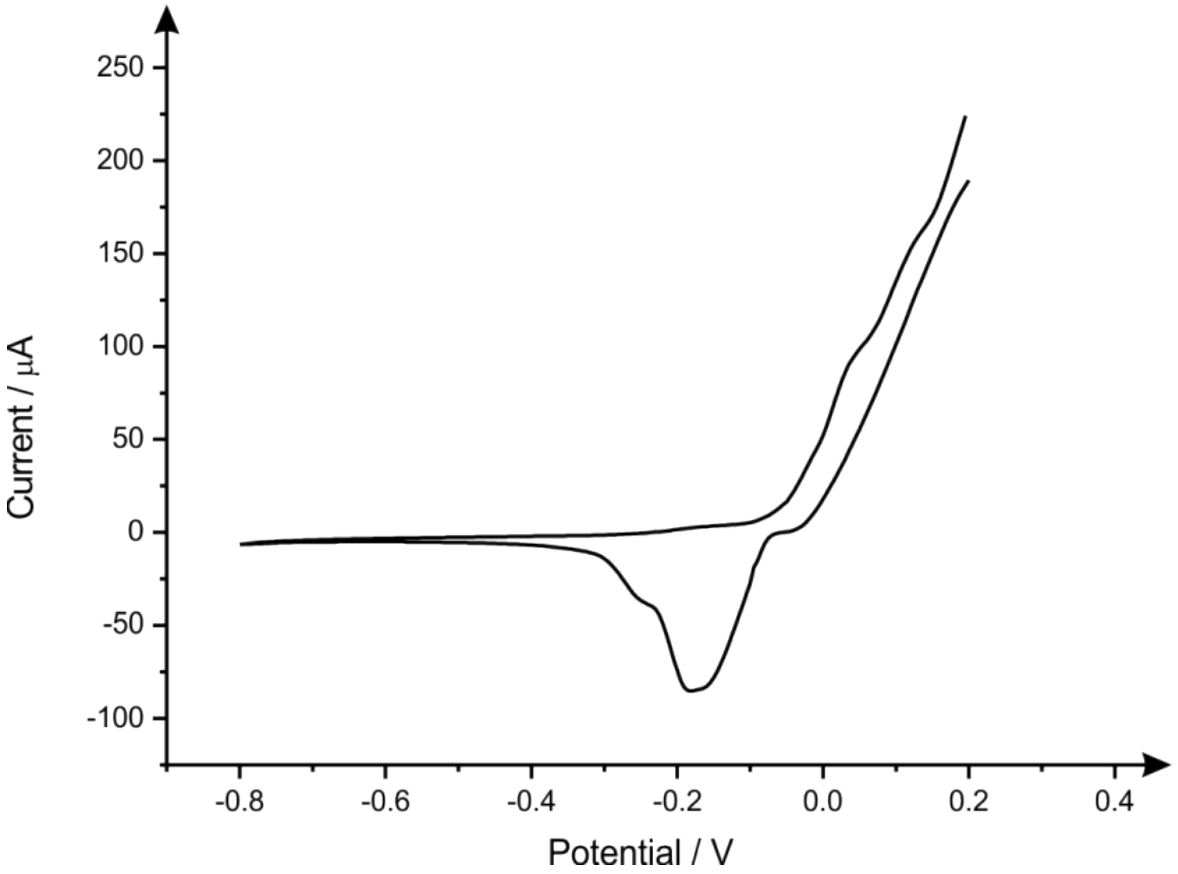
A



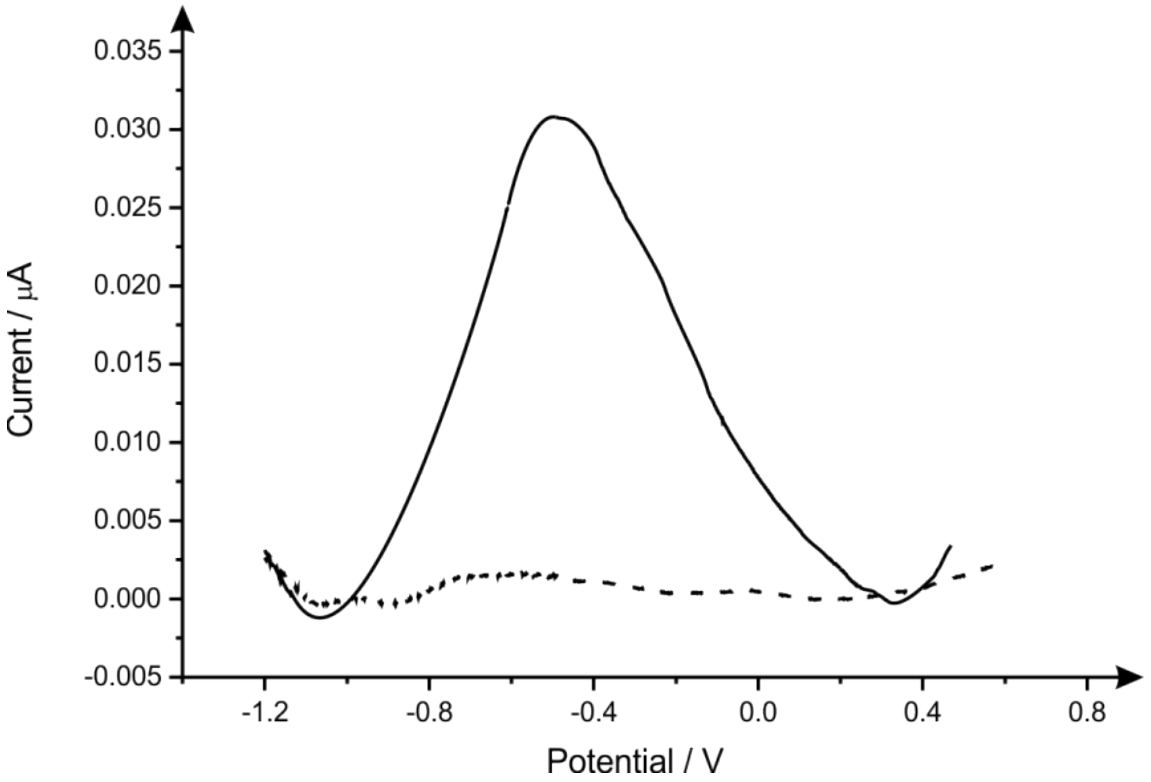
B



ESI Figure 2 Cyclic voltammetric profile of a pre-2012 5p coin in in 1mM Hexaammineruthenium (III) chloride/ 0.1M KCL . Scan rate: 5 mV s^{-1} *vs*. SCE



ESI Figure 3 Square-wave voltammetry showing the response from a sheet of nickel (pure) metal explored in 48.3 nM lead (II) / pH 4 acetate buffer solution. The dotted line represents blank pH 4 acetate buffer solution.



ESI Figure 4 Visual representation of the 5 pence coins used throughout experimentation.[15] Note that the centre of the coin is used as the working electrode where the electrode area is reproducibility defined through the use of the bespoke electrode holder (see earlier figure).