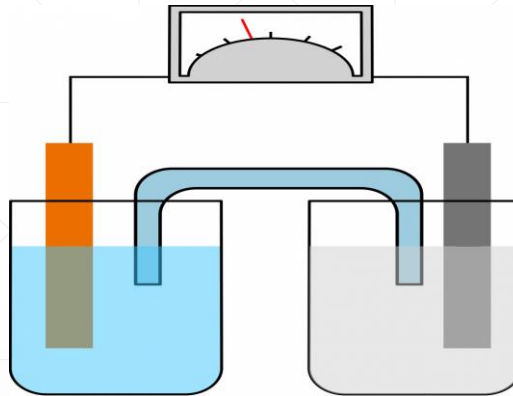


Electrochemical Techniques for Sensing



Institute of Nanotechnology Innovation

Instrument Presentations 2019

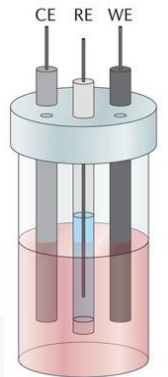
Presenter: Lindokuhle Cindy Nene

Responder: Nthabeleng Molupe

Electrochemical Sensing

Chemistry relating the electrical and chemical phenomena.

- **Electrochemical sensors are cells composed of noble metal electrodes in an electrolyte (analyte).**
- **When an analyte is detected the cell generates a small current proportional to the concentration of the analyte.**



Electrochemical Sensors Everyday

Safety



Road Safety



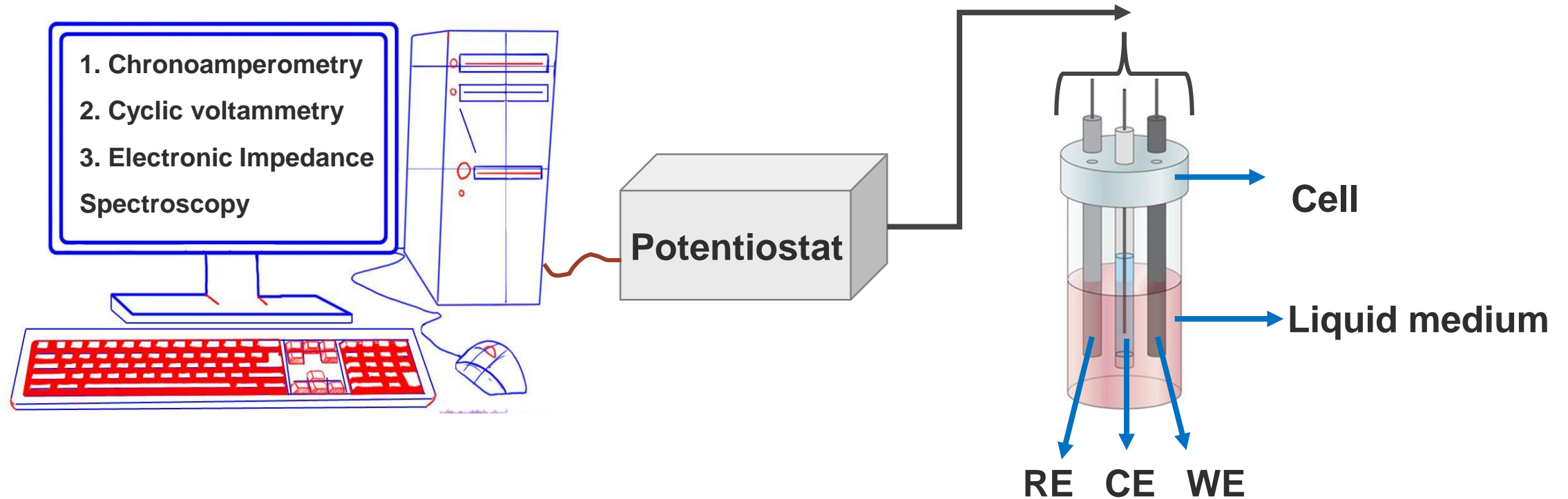
Laboratory



Medicinal

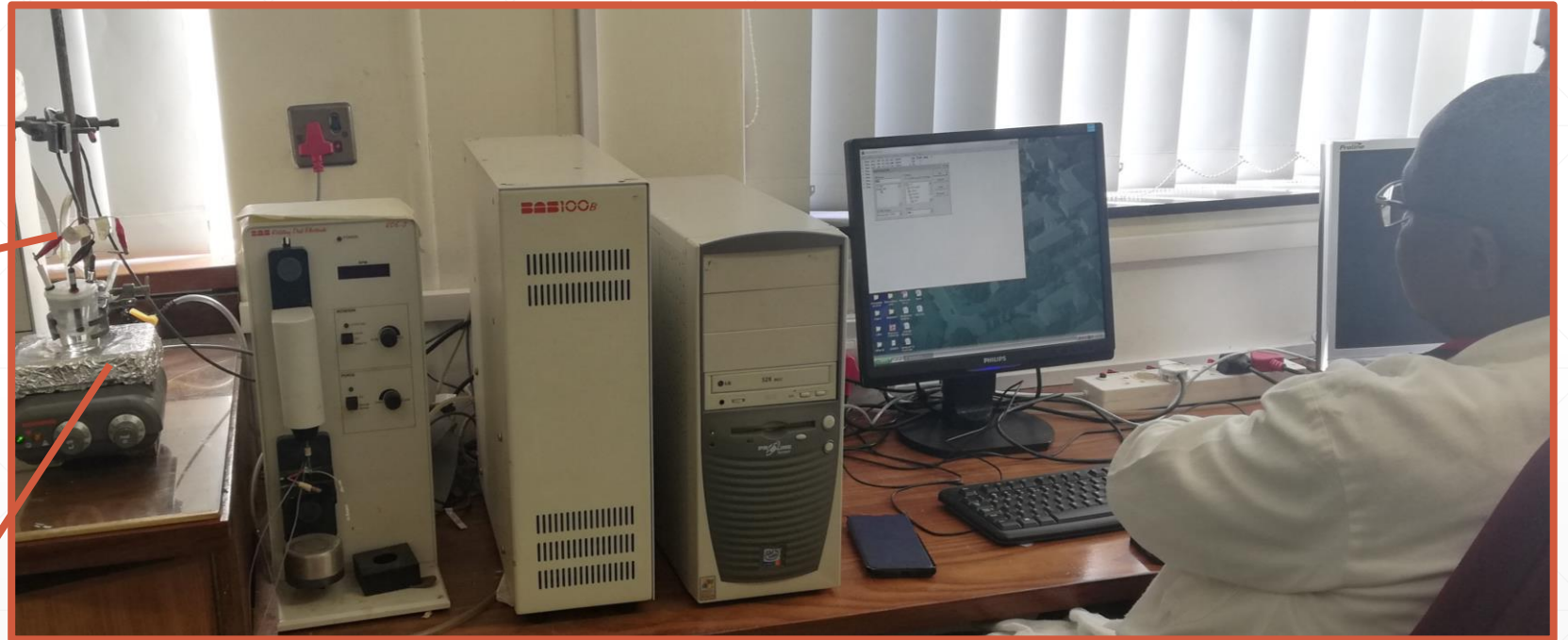


Set Up



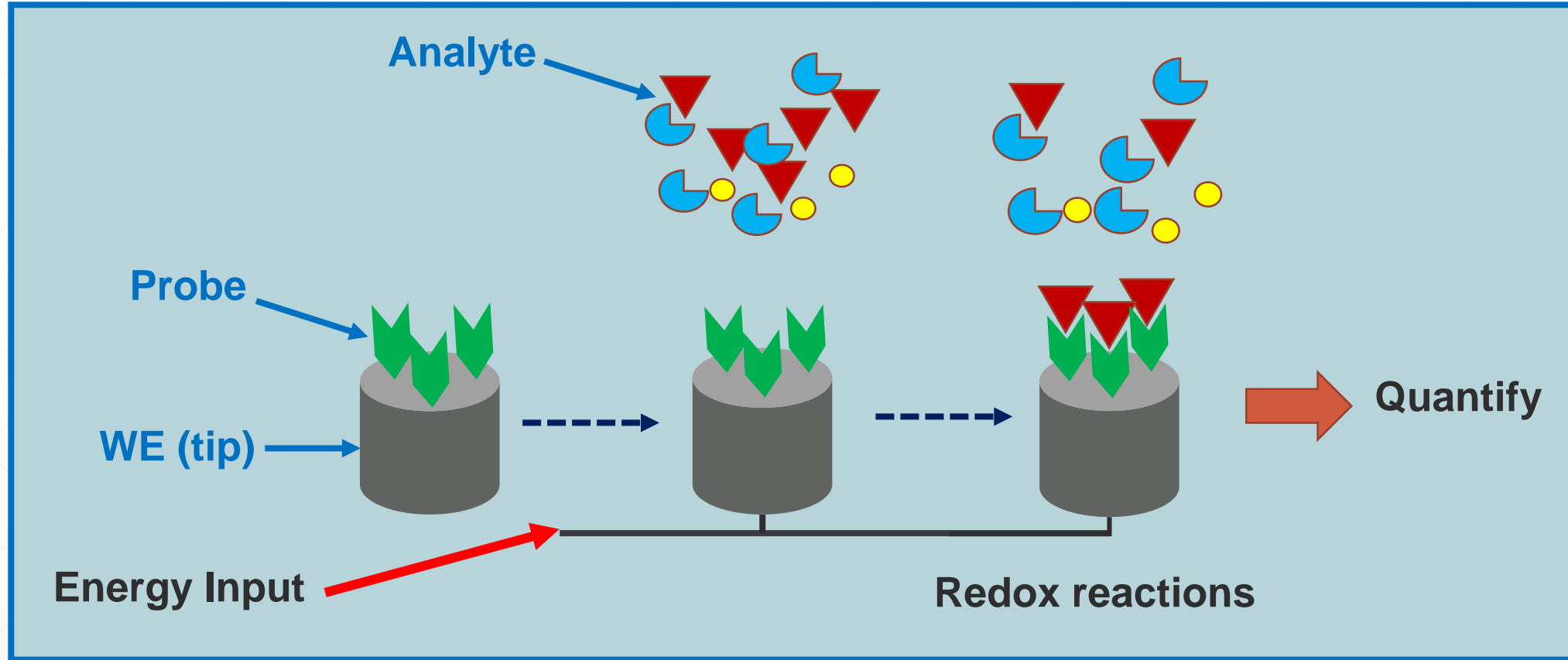
RE: reference electrode; CE: counter electrode; WE: working electrode

Instrument in F26



Cell

Electrochemical Sensing



Sample Preparation

- Probes (solution).

Known concentrations (volume)

- Modification of the WE.

Adsorption

Click

- Selection of the liquid medium in the cell (RE or the probe on the WE).



Chronoamperometry

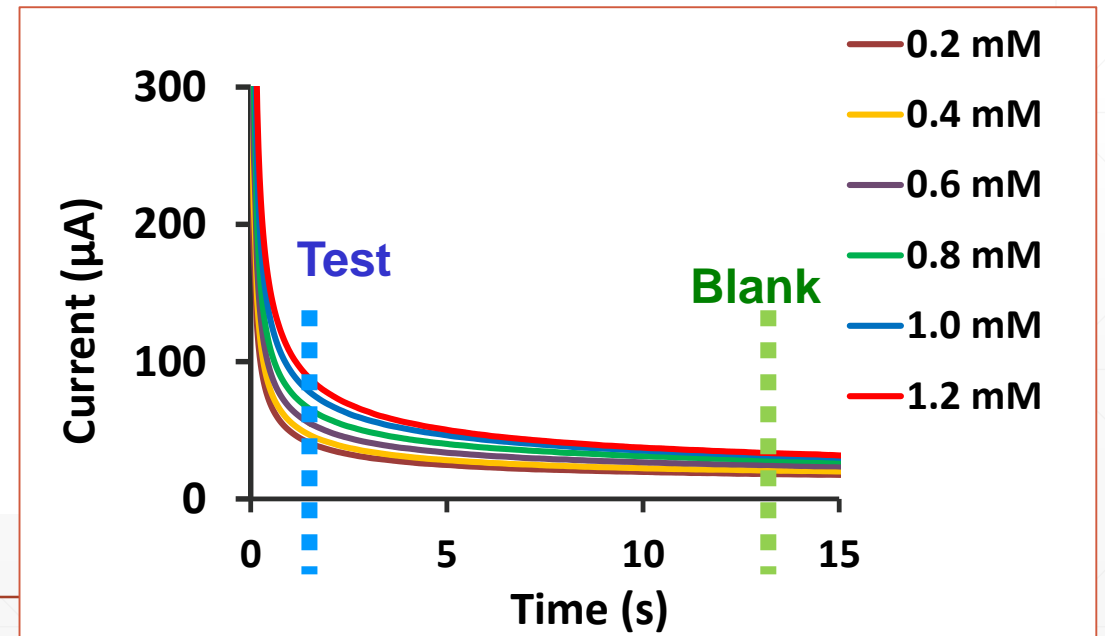
- Probe – analyte affinity.

Comparing two or more systems.

- Sensitivity/ selectivity

$$\text{Limit of detection (LOD)} = \frac{3\sigma}{\text{slope}}$$

Low LOD= Good 😊



Cyclic Voltammetry

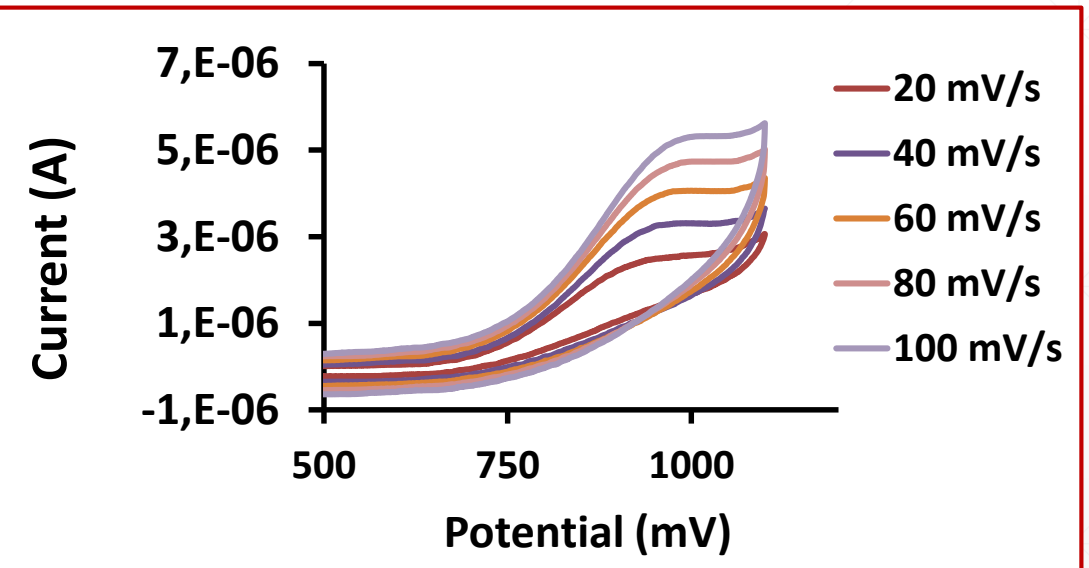
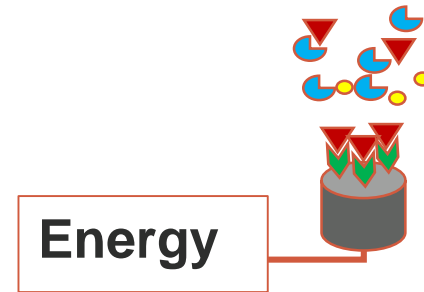
- Type of reaction involved (Probe + analyte).

Oxidation (Top)

Reduction (Bottom)

Redox (Loop)

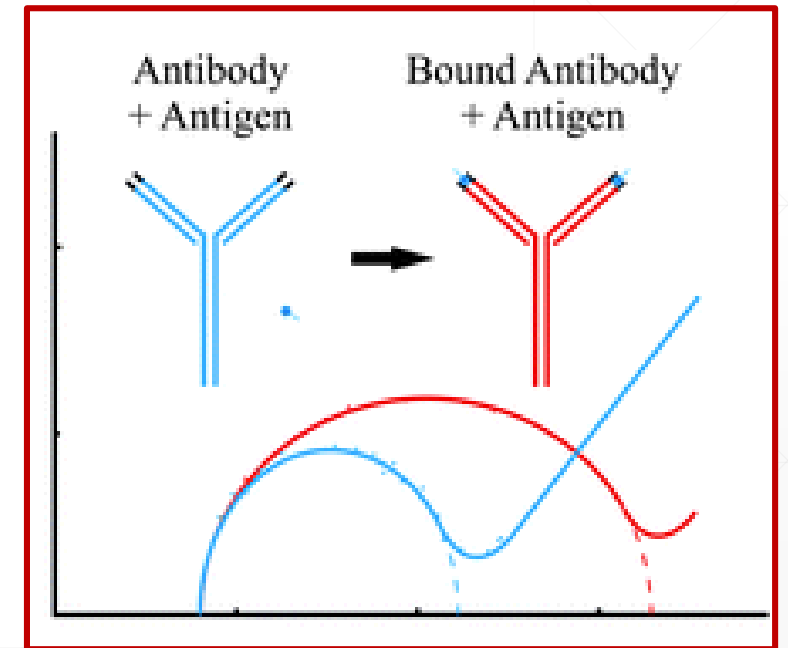
- Quality of probe (Potential).



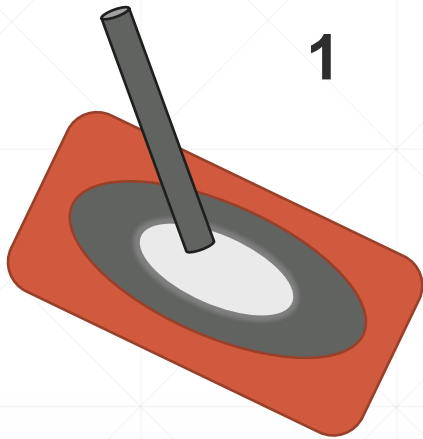
Electron Impedance Spectroscopy

Decrease in conductivity upon probe-analyte coupling

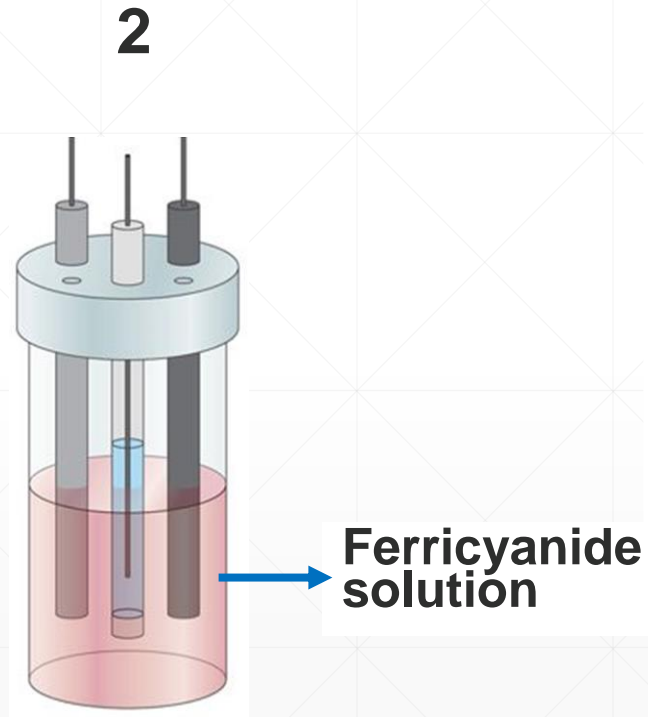
- **Straight line: Conductive (free probe)**
- **Semi-circle: Non-conductive (analyte bound)**



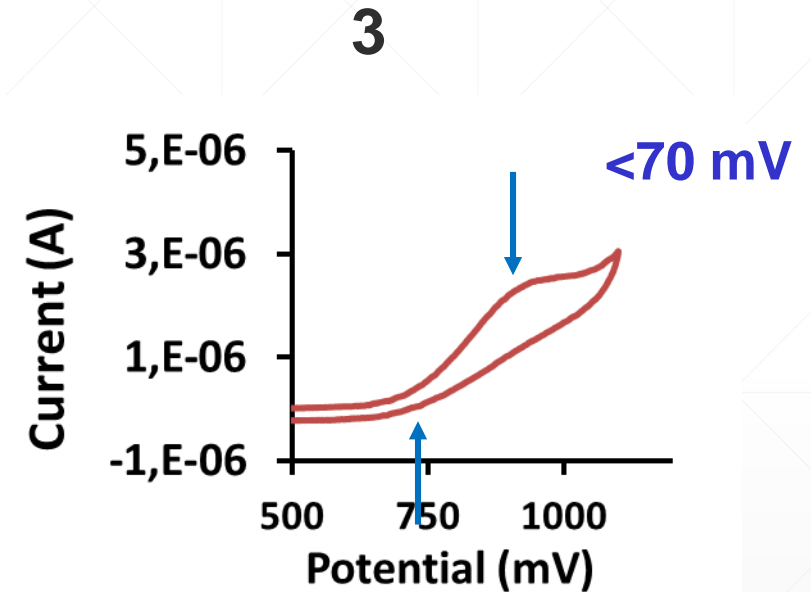
Cleaning the Electrode



- Alumina powder + water
- Polishing (textured) pad
 - Infinity signs
- Rinse with water



- Run CV



- Peak-potential separation

Repeat as much as you can, like or necessary to...



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Thank You

Dist. Prof. T. Nyokong

Nthabeleng Molupe

Reitumetse Nkhahle