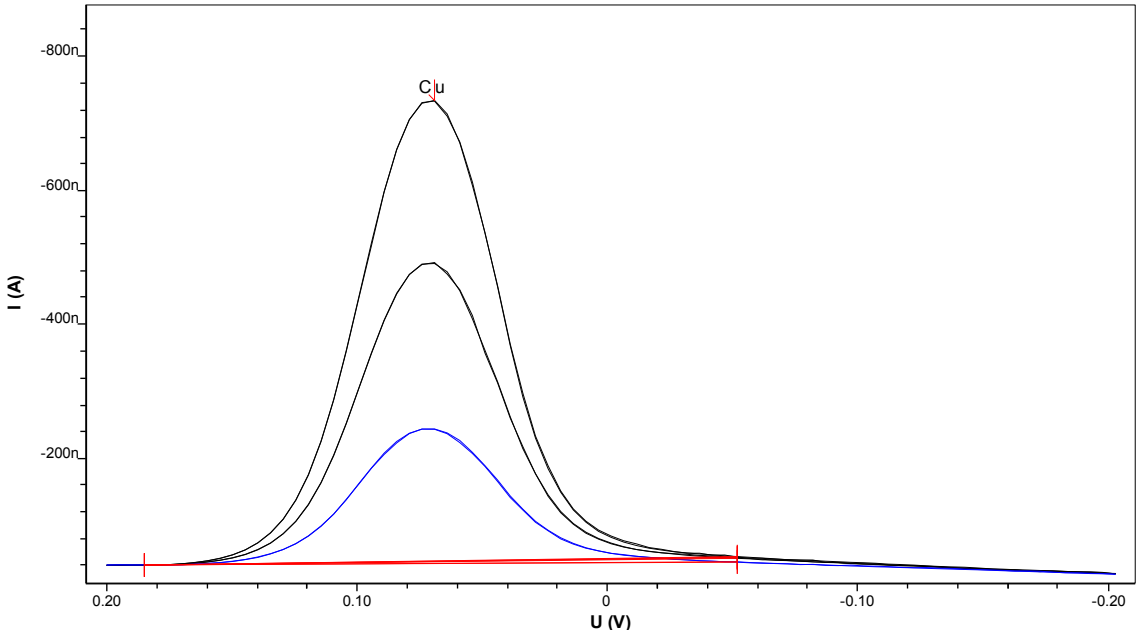
VA Application Note V-203

Determination of copper in electrolyte solutions for production of copper indium gallium selenide (CIGS) solar cells



Copper can be determined in electrolyte solutions used in production of copper indium gallium selenide solar cells – also called CIGS cells – for the electrodeposition of the CIGS absorber layer.

The determination of copper is carried out by polarography after dilution of the sample in sulfuric acid supporting electrolyte.

Results

Cu in CIGS electrolyte solution
160 mg/L

Metrohm

Method description

Sample

Electrolyte solution containing sulfuric acid

Sample preparation

No sample preparation necessary.

Electrodes

Multi-Mode Electrode pro Non-silanized glass capillaries	6.1246.120 6.1226.030
Ag/AgCl/ KCl (3 mol/L) reference electrode. Bridge electrolyte KNO_3 sat.	6.0728.020 6.1245.010
Platinum rod electrode	6.0343.000

Reagents

H_2SO_4	Sulfuric acid, for trace analysis*, w(HCl) = 96%
Cu standard stock solution	ß(Cu^{2+}) = 1 g/L, commercially available
Ultrapure water	Resistivity >18 MΩ·cm (25 °C), type I grade (ASTM D1193)

*e.g., Merck suprapur®, Sigma-Aldrich TraceSelect® or equivalent.

Solutions

Supporting electrolyte	c(H_2SO_4) = 0.1 mol/L made by dilution of concentrated sulfuric acid.
Cu standard solution	ß(Cu^{2+}) = 100 mg/L

Analysis

Measuring solution	10 mL supporting electrolyte + 50 µL undiluted sample

Parameters

Working electrode	DME
Stirring speed	2000 min^{-1}
Mode	DP
Purge time	300 s
Equilibration time	5 s
Start potential	0.2 V
End potential	-0.2 V
Pulse amplitude	0.05 V
Potential step	0.005 V
Potential step time	0.8 s
Sweep rate	0.006 V/s
Peak potential Cu	0.07 V