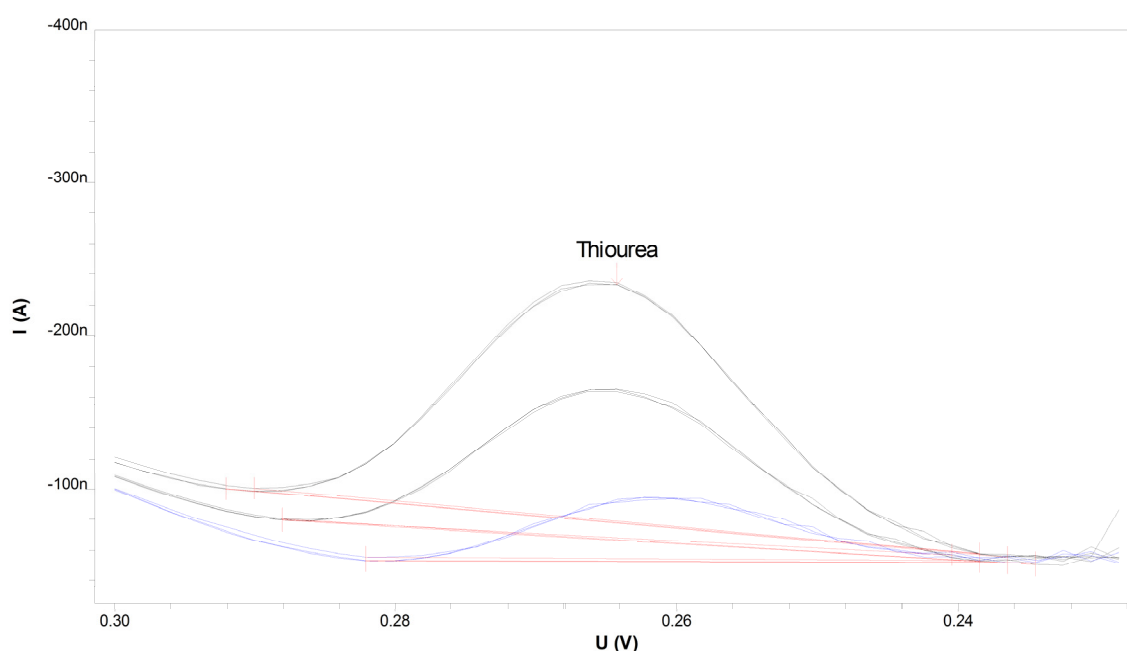


Thiourea in copper electrolytes in copper electrorefining plants



Copper is produced using an electrolysis procedure. Thiourea is added to the copper electrolyte to optimize plating efficiency. With voltammetry thiourea can easily be determined in highly concentrated copper electrolyte solutions containing sulfuric acid and small amounts of chloride.

Results

Thiourea in Cu electrorefining electrolyte

0.7 mg/L

Method description

Sample

- Copper electrolyte

Instrument

797 VA Computrace



Electrodes

Working electrode (WE)	6.1246.020 MME (Multi-Mode Electrode) with 6.1226.030 glass capillary
Reference electrode (RE)	6.0728.020 reference electrode (Ag/AgCl/ c(KCl) = 3 mol/L) with 6.1245.010 glass electrolyte vessel filled with intermediate electrolyte KNO ₃ sat.
Auxiliary electrode (AE)	6.0343.000 platinum electrode

Reagents

HNO ₃	Nitric acid, suprapur, w(HNO ₃) = 65 %
Thiourea	Thiourea, analytical grade
Mercury nitrate	Mercury(II) nitrate dihydrate
Gelatine	
Thiourea standard stock solution	β(thiourea) = 1 g/L

Solutions

HgNO ₃ nitrate solution	β(HgNO ₃ × 2 H ₂ O) = 4.0 g/L
Gelatin solution	c(gelatin) = 1 g/L
Thiourea standard addition solution	β(thiourea) = 200 mg/L

Analysis

Measuring solution	10 mL sample + 0.8 mL HgNO ₃ solution + 0.1 mL gelatin solution
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Parameters

Working electrode	DME
Stirrer speed	2000 rpm
Mode	DP
Initial purge time	300 s
Addition purge time	10 s
Equilibration time	5 s
Pulse amplitude	0.015 V
Start potential	0.3 V
End potential	0.2 V
Voltage step	0.002 V
Voltage step time	0.1 s
Sweep rate	0.002 V/s
Peak potential Al	0.24 V

Comments

Chloride interferes with the polarographic determination of thiourea. Hg(I) ions mask the chloride and eliminate the interference. The volume of the added HgNO₃ nitrate solution has to be chosen in a way that the concentration of mercury is stoichiometrically equal to the chloride concentration. To determine the exact volume for a complete elimination of the chloride interference, HgNO₃ nitrate solution is added in increments of 100 μL until the chloride peak has disappeared.

