Determination of Cyanide and Silver in galvanic bath

Description

Electroplating baths for silver plating usually contain a large excess of cyanides in addition to silver. The silver is present as dicyanoargentate $[Ag(CN)_2]^-$. Free cyanide and silver can be titrated to 2 equivalence points in the alkaline with silver nitrate. The free cyanide first reacts to $[Ag(CN)_2]^-$. With further addition of silver nitrate, insoluble AgCN is formed. The solution becomes turbid after the 1st EQ.

$$2\ CN^- + Ag^+ \rightarrow [Ag(CN)_2]^-$$

$$[Ag(CN)_2]^- + Ag^+ \rightarrow 2\ AgCN$$

Instruments

Titrator	TL 7000 or TL 7750 or TL 7800
Electrode	AgS 62 RG
Cable	L1A
Stirrer	Magnetic stirrer TM 235 or similar
Lab accessory	Beaker 150 mL
	Magnetic stirrer bar 30 mm

Reagents

1	Silver nitrate – solution 0,1 mol/L
2	Potassium hydroxide or Sodium hydroxide 3 mol/L
3	Distilled water
All reagents should be of analytical grade or better.	

Titration procedure

Reagents

$AgNO_3$ – solution 0,1 mol/L

$AgNO_3$ – solution 0,1 mol/L is available as ready-to-use solution. The titer determination of the $AgNO_3$ solution is done as described in the application note "Titer determination of $AgNO_3$".

Cleaning and storage of the electrode

The electrode is rinsed with distilled water. Distilled water is suitable for storage of the AgS 62 RG.

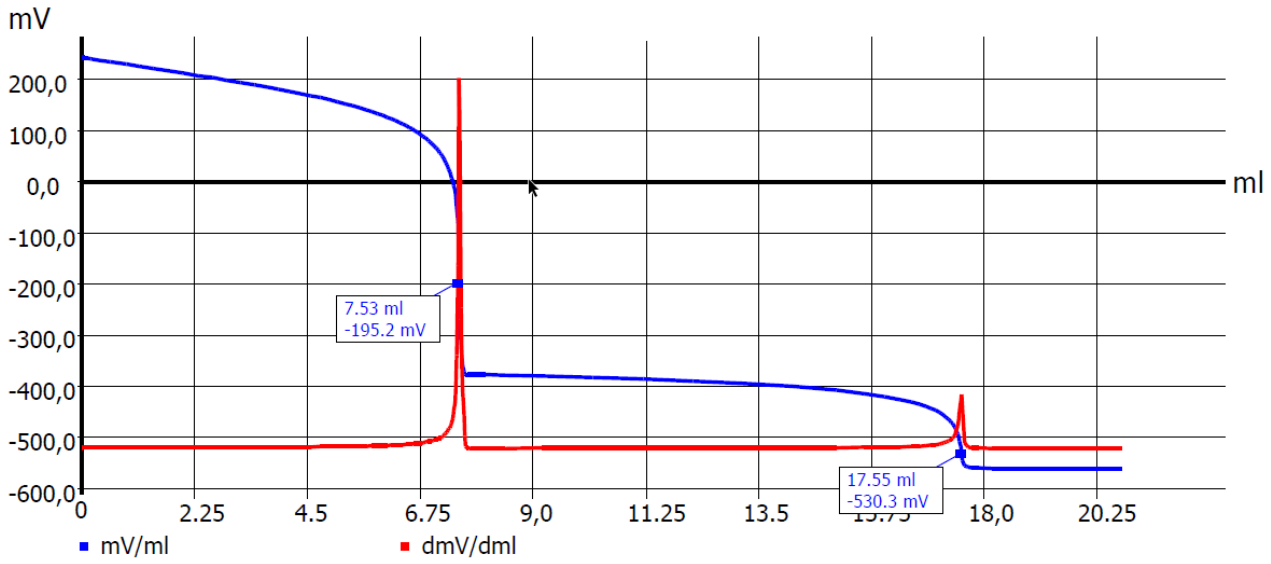
Sample preparation

The sample is pipetted into a 150 mL beaker, made up to approx. 80 mL with distilled water and alkalized with 2 mL KOH or NaOH 3 mol/L. The pH value should be approx. pH 10 - 12. Then it is titrated with $AgNO_3$ – solution 0,1 mol/L to 2 EQs.

The required sample amount can be estimated according to this rule of thumb:

$$V(mL) = \frac{1000 * Titer\ [\frac{mol}{L}]}{expected\ content\ KCN\ [g/L]}$$

Titration parameter



Default method	---		
Method type	Automatic titration		
Modus	Dynamic		
Measured value	mV		
Measuring speed / drift	Individual	Minimum holding time	3 s
		Maximum holding time	15 s
		Measuring time	3 s
		Drift	10 mV/min
Initial waiting time	5 s		
Dynamic	average	Max step size	1.0 ml
		Slope max ml	10
		Min. step size	0.02 ml
		Slope min. ml	120
Damping	none	Titration direction	decrease
Pretitration	off	Delay time	0 s
End value	off		
EQ	On (2)	Slope value	300
Max. titration volume	20 ml		
Dosing speed	100%	Filling speed	30 s

Calculation:

Free Cyanide:

$$KCN\ [g/L] = \frac{(EQ1 - B) * T * M * F1}{V * F2}$$

B	0	Blank value
EQ1		Consumption of titrant at first Equivalence point
T	WA	Actual concentration of the titrant
M	65,12	Molecular weight of KCN
V	man	sample volume [mL]
F1	2	Conversion factor
F2	1	Conversion factor

Silver:

$$Ag\ [g/L] = \frac{(EQ2 - 2 * EQ1) * T * M * F3}{V}$$

EQ1		Consumption of titrant at first Equivalence point
EQ2		Consumption of titrant at first Equivalence point
T	WA	Actual concentration of the titrant
V	man	sample volume [mL]
F3	107,87	Molecular weight of Ag

Any questions? Please contact the application team:

Xylem Analytics Germany Sales GmbH & Co. KG, SI Analytics
Hattenbergstraße 10
D-55122 Mainz, Germany
Telefon: + 49 6131 66 5126
Fax: + 49 6131 66 5101
E-Mail: titration@si-analytics.com