



License ID 459712  
Client ID 001-cmp-00197  
User Metrohm

Program version viva 2.0 - 54 - 1  
2017-10-10 15:29:25 UTC+2

## Method parameters

Method . . . . . AB 254 Determination of Zn Cd Pb  
Method saving date . . . . . 2017-10-10 15:27:48 UTC+2  
Method version . . . . . 1  
Method group . . . . . viva example methods  
Method status . . . . . original  
Method saved by (full name) . . . . . Metrohm International Headquarters  
Method saved by (short name) . . . . . Metrohm

## START

### Main track

#### General

Workplace view

Current view . . . . . on

Track view for live window

Live display 1 . . . . . Main track

Live display 2 . . . . . Main track

Electrode test . . . . . on

#### Application note

Measuring solution 10 mL (diluted) sample 0.5 mL Ammonium acetate / KCl buffer 0.1 mL Ga solution (c(Ga) = 100 mg/L)

#### Sample data variables

Name	Type	Assignment	Fixed value	Comment	Monitoring
ID1	Text	ID1		Sample identification 1	off
ID2	Text	ID2		Sample identification 2	off
ID3	Text	ID3		Sample identification 3	off
Sample type	Text	Sample type		Sample type	off
Sample amount	Number	Sample amount		Sample amount	off
Sample amount unit	Text	Sample amount unit		Sample amount unit	off

Name . . . . . **ID1**

Type . . . . . Text

Assignment . . . . . on, . . . . . ID1

Fixed value . . . . . off, . . . . .

Check at start . . . . . on

Comment . . . . . Sample identification 1

Name . . . . . **ID2**

Type . . . . . Text

Assignment . . . . . on, . . . . . ID2

Fixed value . . . . . off, . . . . .

Check at start . . . . . on



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Comment . . . . . Sample identification 2

Name . . . . . **ID3**  
Type . . . . . Text  
Assignment . . . . . on. . . . . ID3  
Fixed value . . . . . off. . . . .  
Check at start . . . . . on  
Comment . . . . . Sample identification 3

Name . . . . . **Sample type**  
Type . . . . . Text  
Assignment . . . . . on. . . . . Sample type  
Fixed value . . . . . off. . . . .  
Check at start . . . . . on  
Comment . . . . . Sample type

Name . . . . . **Sample amount unit**  
Type . . . . . Text  
Assignment . . . . . on. . . . . Sample amount unit  
Fixed value . . . . . off. . . . .  
Check at start . . . . . on  
Comment . . . . . Sample amount unit

Name . . . . . **Sample amount**  
Type . . . . . Number  
Assignment . . . . . on. . . . . Sample amount  
Fixed value . . . . . off. . . . .  
Check at start . . . . . on  
Comment . . . . . Sample amount  
Variable monitoring . . . . . off  
Lower limit . . . . .  
Upper limit . . . . .  
Message . . . . .  
Display message . . . . . on  
Record message . . . . . on  
Message by e-mail . . . . . off  
    E-mail template . . . . .  
    Subject . . . . . Message from viva - method 'New method 3' - command 'Main track'  
Acoustic signal . . . . . off  
Action . . . . . off  
Cancel determination . . . . . on  
Cancel determination and series . . . . . off

#### Command comment

AB 254: Determination of Zn, Cd and Pb at the MFE

#### Call sample



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**CALL**

Call text	Track name	Sample type	Condition
Call sample	Sample	off Sample	off

**CALL****Call additions**

Call text	Track name	Sample type	Condition
Call additions	Standard addition	off Sample	off

**VA TRACK VA track**

Return immediately . . . . . off

**LOOP****Replications**

## Stop criteria

Max. run number . . . . . on  
Max. run number . . . . . 2  
Maximum run time . . . . . off  
Signal assessment for DT . . . . . off  
Condition . . . . . off

**DP****ASV****General/Hardware**

## Device

Device name . . . . . 884\_1  
Device type . . . . . 884 Professional VA

## Sensors/Electrodes

Working electrode . . . . . RDE  
Sensor type . . . . . RDE/SSE  
Reference electrode . . . . . Reference electrode  
Auxiliary electrode . . . . . Auxiliary electrode  
Electrode test . . . . . on

## Stirrer

Stirring rate . . . . . 2000 min<sup>-1</sup>  
Hydrodynamic measurement . . . . . off

**Pretreatment**

Stirring time . . . . . 10 s

## Cyclovoltammetric pretreatment

Start potential . . . . . -1.4 V  
Vertex potential . . . . . -0.7 V  
Sweep rate . . . . . 1 V/s  
Cycles . . . . . 10  
Duration . . . . . 14.00 s

## Potentiostatic pretreatment

Potential 1 . . . . . -0.1 V  
Waiting time 1 . . . . . 5 s  
Potential 2 . . . . . -1.4 V



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Waiting time 2 . . . . . 10 s  
Potential 3 . . . . . off V  
Waiting time 3 . . . . . 0.0 s  
Potential 4 . . . . . off V  
Waiting time 4 . . . . . 0.0 s  
Potential 5 . . . . . off V  
Waiting time 5 . . . . . 0.0 s  
Equilibration time . . . . . 5.0 s

#### Sweep

Start potential . . . . . -1.2 V  
End potential . . . . . -0.35 V  
Potential step . . . . . 0.004 V  
Potential step time . . . . . 0.1 s  
Sweep rate . . . . . 0.040 V/s  
Pulse amplitude . . . . . 0.05 V  
Pulse time . . . . . 0.04 s  
Measuring time . . . . . 0.02 s  
Sweep duration . . . . . 21.25 s

#### Post-treatment

##### Cleaning

Cleaning potential . . . . . off V  
Cleaning time . . . . . 0.0 s

##### Standby potential

Standby potential . . . . . off V

#### Potentiostat

##### Current measuring range

Highest range . . . . . 2 mA  
Lowest range . . . . . 20  $\mu$ A  
Automatically select optimum current measuring range . . . . . on

#### TRACK

##### Sample

Return immediately . . . . . off  
Delete old data . . . . . off

#### ADD SAMPLE

##### Add sample

##### Addition

Add manually . . . . . on  
Display standard message . . . . . on  
Display message defined by the user . . . . . off  
Already added . . . . . off  
Add with dosing device . . . . . off

#### ADD AUX

##### Add electrolyte

##### Auxiliary solution

Solution . . . . . Electrolyte  
Volume . . . . . 0.5 mL  
Include volume in calculation . . . . . on



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#### Addition

Add manually . . . . . on  
Display standard message . . . . . on  
Display message defined by the user . . . . . off  
Already added . . . . . off  
Add with dosing device . . . . . off

#### ADD AUX Add Ga

##### Auxiliary solution

Solution . . . . . Ga solution  
Volume . . . . . 0.1 mL  
Include volume in calculation . . . . . on

#### Addition

Add manually . . . . . on  
Display standard message . . . . . on  
Display message defined by the user . . . . . off  
Already added . . . . . off  
Add with dosing device . . . . . off

#### ELECTRODE TEST Electrode test

##### Device

Device name . . . . . 884\_1  
Device type . . . . . 884 Professional VA

##### Sensors/Electrodes

Working electrode . . . . . GC RDE 00560448  
Sensor type . . . . . RDE/SSE

##### Stirrer

Stirring rate . . . . . 2000 min<sup>-1</sup>

#### STIR & PURGE

##### Initial purge

##### Device

Device name . . . . . 884\_1  
Device type . . . . . 884 Professional VA

##### Stir

Stirring rate . . . . . 2000 min<sup>-1</sup>  
Switch on . . . . . on  
Switch off . . . . . off  
Duration . . . . . off

##### Purge

Switch on . . . . . off  
Switch off . . . . . off  
Duration . . . . . on  
Time . . . . . 300 s

##### Measure sample

Call text . . . . . Measure sample



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**CALL VA** Track name . . . . . VA track

Condition . . . . . off

**TRACK Standard addition**

Return immediately . . . . . off

Delete old data . . . . . off

**LOOP Variations**

Stop criteria

Max. run number . . . . . on

Max. run number . . . . . 2

Maximum run time . . . . . off

Signal assessment for DT . . . . . off

Condition . . . . . off

**ADD STD Add standard Zn**

Standard

Solution . . . . . Standard Zn

Addition increments

Number . . . . . 1

Addition volume 1 . . . . . 0.05 mL

Addition

Add manually . . . . . on

Display standard message . . . . . on

Display message defined by the user . . . . . off

Already added . . . . . off

Add with dosing device . . . . . off

**ADD STD Add standard Cd**

Standard

Solution . . . . . Standard Cd

Addition increments

Number . . . . . 1

Addition volume 1 . . . . . 0.05 mL

Addition

Add manually . . . . . on

Display standard message . . . . . on

Display message defined by the user . . . . . off

Already added . . . . . off

Add with dosing device . . . . . off

**ADD STD Add standard Pb**

Standard

Solution . . . . . Standard Pb

Addition increments

Number . . . . . 1



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Addition volume 1 . . . . . 0.05 mL

Addition

Add manually . . . . . on  
Display standard message . . . . . on  
Display message defined by the user . . . . . off  
Already added . . . . . off  
Add with dosing device . . . . . off

**STIR &  
PURGE**

**Addition purge**

Device

Device name . . . . . 884\_1  
Device type . . . . . 884 Professional VA

Stir

Stirring rate . . . . . 2000 min<sup>-1</sup>  
Switch on . . . . . on  
Switch off . . . . . off  
Duration . . . . . off

Purge

Switch on . . . . . off  
Switch off . . . . . off  
Duration . . . . . on  
Time . . . . . 20 s

**CALL VA**

**Measure additions**

Call text . . . . . Measure additions  
Track name . . . . . VA track  
Condition . . . . . off

**TRACK**

**Shut off**

Return immediately . . . . . off  
Delete old data . . . . . off

**STIR &  
PURGE**

**STIR & PURGE OFF**

Device

Device name . . . . . 884\_1  
Device type . . . . . 884 Professional VA

Stir

Stirring rate . . . . . 2000 min<sup>-1</sup>  
Switch on . . . . . off  
Switch off . . . . . on  
Duration . . . . . off

Purge

Switch on . . . . . off  
Switch off . . . . . on  
Duration . . . . . off

**MAIN  
VALVE**

**N2 OFF**

Device



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Device name . . . . . 884\_1  
Device type . . . . . 884 Professional VA  
Action  
Open . . . . . off  
Close . . . . . on

**EXIT Exit track**

**CALL Exit shut off**

Call text	Track name	Sample type	Condition
Exit shut off	Shut off	off Sample	off

**ERROR Error track**

**CALL Error shut off**

Call text	Track name	Sample type	Condition
Error shut off	Shut off	off Sample	off

## Evaluation parameters

### General

#### ASV

#### Data processing

Smoothing . . . . . 1  
Reversed peaks . . . . . off

#### Curve evaluation

Fixed point evaluation . . . . . off

### Substances

#### ASV

#### Substances - Recognition

Substance	Active	Characteristic potential	Tolerance	Min. width	Max. width	Min. measured quantity
Zn	on	-1.05 V	0.05 V	0.01 V	0.5 V	5 nA
Cd	on	-0.65 V	0.05 V	0.01 V	0.5 V	1 nA
Pb	on	-0.46 V	0.05 V	0.01 V	0.5 V	1 nA

#### ASV

#### Substances - Baseline





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Substance	Baseline type	Start base point	End base point
Zn	Linear	Automatically	Automatically
Cd	Linear	Automatically	Automatically
Pb	Linear	Automatically	Automatically

## Standards

### Standards

Name	Standard Zn	Standard Cd	Standard Pb
Zn	5.0 mg/L	0 mg/L	0 mg/L
Cd	0 mg/L	0.5 mg/L	0 mg/L
Pb	0 mg/L	0 mg/L	1.0 mg/L

## Calibration

### General

Calibration method . . . . . Standard addition  
Blank value correction with evaluation . . . . . off  
quantity

### ASV

#### Calibration curves

Substance	Evaluation quantity	Curve type	Weighting
Zn	Height	Linear regression	on
Cd	Height	Linear regression	on
Pb	Height	Linear regression	on

## Results

### Substance concentration in the sample

#### ASV

Substance	Decimal places	Assignment
Zn	3	RS01
Cd	3	RS02
Pb	3	RS03

## Results

### Additional results

Result	Places	Prefix	Unit
Peak potential	3		V
Height	2	#	A



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Result	Places	Prefix	Unit
RSD of the heights of all replications	1		%
Area	2	#	C
RSD of the areas of all replications	1		%
Start base point	3		
End base point	3		
Standardized area	3		
Standardized height	3		
Total volume	3	#	L
Zero-order coefficient	3		
First-order coefficient	3		
Second-order coefficient	3		
Fourth-order coefficient	3		
Coefficient of determination	5		
Substance concentration in measuring vessel	2	#	
RSD of the substance concentration in measuring vessel	1		%
Amount of substance	2	#	
RSD of the substance concentration in the sample	1		%
Effective addition volume of the standard solution for the evaluation ratio	2	#	L
RSD of the effective addition volume of the standard solution for the evaluation ratio	1		%
Calibration factor DT	2	#	
RSD of the calibration factor DT	1		%
Effective addition volume of the sample solution for the evaluation ratio	2	#	L
RSD of the effective addition volume of the sample solution for the evaluation ratio	1		%

#### Database

Name database . . . . . viva