AQUACOUNTER Application Sheet	COM series	DATA No. G3	1st edition
Metal	Quantification of fluorine, bromine and chlorine in solder flux		

1. Measurement outline

The quantification method for halogen ions in resin type flux for soldering is stipulated in JIS Z 3197. This section introduces an example in which fluorine (F^-), bromine (Br^-) and chlorine (Cl^-) ions were quantified by precipitation titration in conformance to JIS.

The measurement procedure is provided below:

(1) Sample is pulverized and approximately 1g is weighed precisely into a 100mL beaker.

(2) 50mL of ethanol : benzene (1 : 1) solvent mixture is added to dissolve the sample.

(3) Potentiometric titration is conducted with silver nitrate titrant.

$$F^- + AgNO_3 \rightarrow AgF + NO_3^-$$
$$Br^- + AgNO_3 \rightarrow AgBr + NO_3^-$$
$$Cl^- + AgNO_3 \rightarrow AgCl + NO^{3-}$$

2. Reagents and Electrodes

(1) Reagents	Titrant	0.01mol/L $AgNO_3$ titrant (for Rosin Br) 0.02mol/L $AgNO_3$ titrant (for Rosin BrCl, Rosin F)
	Solvent	50mL ethanol : benzene (1 : 1)
(2) Electrodes	Indicator electrode	Silver indicator electrode AG-312 to IE jack (P/N D231259-A *for titration in organic solvent)
	Reference electrode	Silver reference electrode MS-231 to RE jack (P/N D231243-A)

3. Measurement conditions examples (for COM-1600S + 2 units of Buret B-2000-20)

Table 1 List of measurement conditions

Sample	Rosin Br	Rosin Br,Cl		Rosin F
Master file	1	2		3
Condition file	1	2 + 3		4
Method	Auto	Auto		Auto
Amp No.	2	2		2
Buret No.	1	2		2
Meas Unit	mV	mV		mV
S Timer	10 sec	10 sec	0 sec	10 sec
CP mL	0 mL	0 mL	0 mL	0 mL
DP mL	0 mL	0 mL	0 mL	0 mL
End Sens	1000	99999	500	1000
Over mL	0.2 mL	0 mL	0.2 mL	0 mL
Max volume.	40 mL	20 mL	20 mL	20 mL
Unit	%	%	%	%
Blank	Blank result value*	*	*	*
Factor	Titer of the titrant**	**	**	**
Molarity	0.01	0.02	0.02	0.02
K	79.9	79.9	35.45	19
Formula	(D-B)×K×F×M/(S×10)***	***	***	***
Mode	20	9	5	6
Pre Int	0	0	0	0
Del K	0	2	5	2
Del Sens	0	0	0	0
Int Time	5	5	3	3
Int Sens	3	3	3	3
Brt Speed	2	2	2	2
Pulse	20	40	40	40

4. Measurement example

(1) Rosin Br

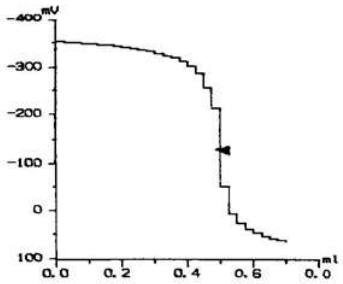

Table 2 Measurement results on bromine in rosin Br

Sample No.	Sample volume (g)	Titration value (mL)	Concentration (%)
1	0.9151	0.442	0.0383
2	0.9999	0.488	0.0388
	Avg.		0.0386 %

(2) Rosin BrCl

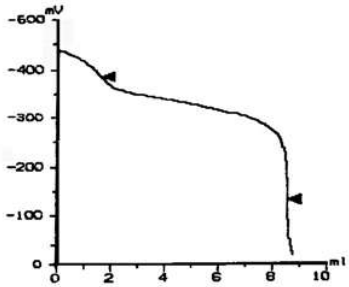

Table 3 Measurement results on bromine and chlorine in rosin BrCl

Sample No.	Sample volume (g)	Bromine		Chlorine	
		Titration value (mL)	Concentration (%)	Titration value (mL)	Concentration (%)
1	0.9984	1.564	0.2505	6.931	0.4963
2	1.0012	1.613	0.2577	6.912	0.4914
3	0.9999	1.605	0.2567	6.948	0.4946
	Avg		0.2550 %		0.4941 %
	Std.Dev.		0.00339 %		0.0025 %
	C.V.		1.53 %		0.085 %

(3) Rosin F

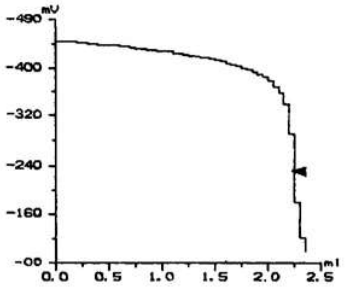

Table 4 Measurement results on fluorine in rosin F

Sample No.	Sample volume (mL)	Titration value (mL)	Concentration (%)
1	0.999	2.227	0.0849
2	1.000	2.228	0.0848
3	1.000	2.230	0.0849
	Avg.		16.629 ppm
	Std. Dev.		0.048 ppm
	C.V.		0.29 %

5. Outline

(1) About fractionation titration on bromine ion and chlorine ion

The sample rosin BrCl contains both bromine ion and chlorine ion, and they were titrated with fractionation by precipitation in this section. The titration curve for bromine ion has small potential change at the end point compared to the titration curve of chlorine ion, and bromine ion is titrated first, followed by the chlorine ion. In general, titration value for bromine ion tends to be higher by including some chlorine ion.

(2) About titration of chlorine ion

Solder analysis stipulated in JIS also has “measurement of chlorine content in rosin-core solder Z 3283” besides the JIS introduced in this section. Please refer to it as well.

Key words

Bromine ion, chlorine ion, fluorine ion, solder flux, precipitation titration, fractionation titration

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