Metrohm

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Automatic determination of the bromine number and the bromine index in petroleum products

Branch

General analytical chemistry; organic chemistry; petrochemistry, biofuels; trace analysis; paints, lacquers, solvents

Keywords

Titration; potentiometric titration; bromine number; bromine index; double Pt-wire electrode; petroleum products; aliphatic hydrocarbons; aromatic hydrocarbons; OMNIS Advanced Titrator; ASTM D1159; ASTM D2710; ASTM D5776; ISO 3839; BS 2000-130; IP 130; IP 299; DIN 51774-1; DIN 51774-2; GB/T 11135; GB/T 11136; SH/T 1767; UOP-304; branch 1; branch 3; branch 5; branch 7; branch 9; branch 14; 6.0341.100

Summary

The bromine number and bromine index are important quality control parameters for the determination of aliphatic C=C double bonds in petroleum products. Both indices provide information on the content of substances that react with bromine. The difference between the two indices is that the bromine number indicates the consumption of bromine in g for 100 g sample and the bromine index in mg for 100 g sample.

This Application Bulletin describes the determination of the bromine number according to ASTM D1159, ISO 3839, BS 2000-130, IP 130, GB/T 11135 and DIN-51774-1. The bromine index determination for aliphatic hydrocarbons is described according to ASTM D2710, IP 299, GB/T 11136 and DIN 51774-2. For aromatic hydrocarbons the determination of the bromine index is described according to ASTM D5776 and SH/T 1767.

UOP 304 is not recommended for the determination of the bromine number or bromine index because its titration solvent contains mercuric chloride.

Bromine number

Instruments

- Titrator with DET Ipol and MET Ipol mode
- 10 mL buret
- Stirrer
- Thermostat
- Titration vessel with thermostat jacket

Electrodes

Double Pt-wire electrode for coulometry	6.0341.100
Pt1000 temperature sensor	6.1110.100

Reagents

- Potassium bromide, KBr, ≥ 99.0%
- Potassium bromate, $KBrO_3$, ≥ 99.8%
- Glacial acetic acid, CH_3COOH, ≥ 99.8%
- Methanol, CH_3OH, ≥ 99.8%
- Toluene, C_7H_8, ≥ 99.3%
- Hydrochloric acid, HCl conc., ≥ 37%
- Sulfuric acid, H_2SO_4 conc., 95.0 – 97.0%
- Potassium iodide, KI, ≥ 99.5%
- Sodium thiosulfate solution, $c(Na_2S_2O_3)$ = 0.1 mol/L

Solutions

Titrant	$c(Br_2)$ = 0.25 mol/L = $c(Br^-/BrO_3^-)$ = 0.5 mol/L KBr and $KBrO_3$ are dried for 30 min in a drying oven at 105 °C and allowed to cool down in a desiccator for at least 2 h. 51.0 g KBr and 13.92 g $KBrO_3$ are separately dissolved in 200 mL deionized water. Both solutions are poured into a 1000 mL volumetric flask and then filled up to the mark with deionized water.

Sulfuric acid	$w(H_2SO_4)$ = 16.7% 500 mL deionized water is added into a glass bottle. While stirring 100 mL conc. H_2SO_4 is slowly added and the solution is allowed to cool down to room temperature.
Titration solvent	714 mL glacial acetic acid, 134 mL toluene, 134 mL methanol and 18 mL $w(H_2SO_4)$ = 16.7% are added into a 1000 mL glass flask and mixed well.
Potassium iodide solution	w(KI) = 15% 15.0 g KI is weighed into a 100 mL volumetric flask and dissolved in approximately 50 mL deionized water. The flask is then filled up to the mark with deionized water.

Sample preparation

For samples, which cannot be directly weighed or injected into the titration vessel, a sample solution is prepared. The recommended sample size (see table below) is weighed into a 50 mL volumetric flask and dissolved in approximately 30 mL toluene. The flask is then filled up to the mark with toluene.

Table 1: Recommended sample size used for 50 mL sample solution depending on the expected bromine number

Expected bromine number in g bromine/100 g sample	Sample size in g for dilution
0 to 10	20 to 16
Over 10 to 20	10 to 8
Over 20 to 50	5 to 4
Over 50 to 100	2 to 1.5
Over 100 to 150	1.0 to 0.8
Over 150 to 200	0.8 to 0.6

Analysis

Titer

50 mL glacial acetic acid and 1 mL conc. HCl are added into the titration vessel. While stirring, the solution is cooled down for 10 min (thermostat set to 1 °C). Afterwards, 1 mL $c(Br_2)$ = 0.25 mol/L and 5 mL w(KI) = 15% are dosed into the titration vessel and the solution is stirred for further 5 min. Then, 50 mL deionized water is added and while continuing cooling the solution is titrated with $c(Na_2S_2O_3)$ = 0.1 mol/L until after the equivalence point.

After each titration, the titration vessel with thermostat jacket, the buret tips and the electrode are rinsed with deionized water.

Blank

110 mL titration solvent are added into the titration vessel and while stirring, the solution is cooled down to 4.5 °C, monitored with the Pt1000 temperature sensor. The solution is then titrated with $c(Br_2)$ = 0.25 mol/L until after the equivalence point.

In case a sample solution is used, additionally 5 mL toluene are added together with the titration solvent into the titration vessel.

After each titration, the titration vessel with thermostat jacket, the buret tips and the electrode are rinsed with titration solvent.

Sample

110 mL titration solvent is added into the titration vessel. An appropriate amount of sample (see table below) or a 5 mL aliquot of prepared sample solution is added into the titration vessel and while stirring, the solution is cooled down to 4.5 °C, monitored with the Pt1000 temperature sensor. The solution is then titrated with $c(Br_2)$ = 0.25 mol/L until after the equivalence point.

The same rinsing procedure as for the blank determination is applied.

Table 2: Recommended sample size for direct injection / direct weighed samples depending on the expected bromine number

Expected bromine number in g bromine/100 g sample	Sample size in g
0 to 10	2 to 1.6
Over 10 to 20	1 to 0.8
Over 20 to 50	0.5 to 0.4
Over 50 to 100	0.2 to 0.15
Over 100 to 150	0.1 to 0.08
Over 150 to 200	0.08 to 0.06

Parameters

Titer

Mode	DET Ipol
Pause	60 s
Start volume	4 mL
Stirring rate	8
Signal drift	30 mV/min
Min. waiting time	5 s
Max. waiting time	32 s
Meas. point distance	3
Min. volume increment	10 µL
Max. volume increment	100 µL
I(pol)	1.0 µA
Stop EP	1
Volume after EP	0.5 mL
EP criterion	20
EP recognition	Greatest

Blank and sample

Mode	MET Ipol
Pause	60 s
Start volume	0 mL
Stirring rate	15
Signal drift	Off
Min. waiting time	30 s
Max. waiting time	30 s
Volume increment	0.020 mL
I(pol)	1.0 µA
Stop volume	Off
Stop measured value	100 mV
Stop EP	Off
EP criterion	30 mV
EP recognition	Greatest

Temperature control

Mode	MEAS T
Stirring rate	15
Measuring parameters	Time-controlled measurement
Measurement duration	10000 s
Stop measured value	4.5 °C

Calculation

Titer

$$f = \frac{V_{EP1} \times c_{Na2S2O3}}{V_{Br2} \times 2 \times c_{Br2}}$$

f:	Titer of titrant
V_{EP1}:	Titrant consumption until the first equivalence point in mL
$c_{Na2S2O3}$:	Concentration of sodium thiosulfate solution, $c(Na_2S_2O_3)$ = 0.1 mol/L
V_{Br2}:	Volume $c(Br_2)$ = 0.25 mol/L solution in mL
2:	Stoichiometric factor
c_{Br2}:	Concentration of bromine solution, $c(Br_2)$ = 0.25 mol/L

Blank

$$Blank = V_{EP1}$$

Blank:	Blank of the titration solvent in mL
V_{EP1}:	Titrant consumption until the first equivalence point in mL

Sample

$$BN = \frac{(V_{EP1} - Blank) \times c_{Br2} \times f \times M_{Br2}}{m_S \times 10}$$

BN:	Bromine number in g bromine/100 g sample
V_{EP1}:	Titrant consumption until the first equivalence point in mL
Blank:	Blank of the titration solvent in mL
c_{Br2}:	Concentration of bromide-bromate solution, $c(Br_2)$ = 0.25 mol/L
f:	Titer of titrant
M_{Br}:	Molecular weight of bromine $M(Br_2)$ = 159.808 g/mol
m_S:	Sample size in g
10:	Conversion factor for mg/g in g/100g

Example determination

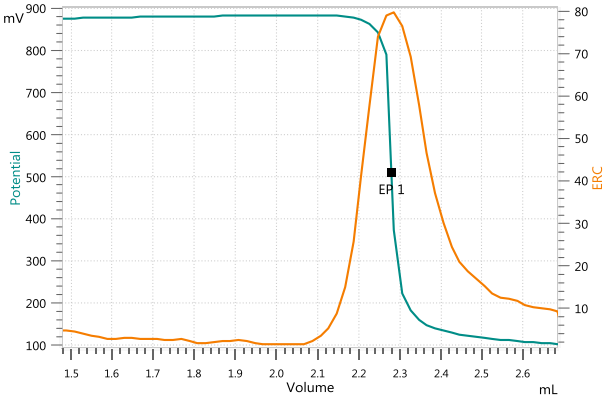

Fig. 1: Determination of the bromine number of transformer oil

Comments

- The standard ASTM D1159 uses 1,1,1-trichloroethane or dichloromethane in the titration solvent. These chlorinated solvents should be replaced with diethyl carbonate or toluene.
- The standards ISO 3839, BS 2000-130, GB/T 11135 and IP 130 are identical to ASTM D1159.
- The standard DIN 51774-1 is similar to ASTM D1159. The difference is:
  - Titration solvent uses $w(H_2SO_4)$ = 20% instead of $w(H_2SO_4)$ = 16.7% and additionally 20 mg lithium chloride are added per litre.
- The standard UOP 304 is similar to ASTM D1159. However, UOP 304 is not recommended for the determination of the bromine number because its titration solvents contains mercuric chloride.
- The thermostat is set to 1 °C all the time.
- To be sure, that the temperature is between 0 °C and 5 °C, the solution temperature is monitored with a Pt1000 temperature sensor during the titration.

References

- ASTM D1159
  Standard Test Method for Bromine Numbers of Petroleum Distillates and Commercial Aliphatic Olefins by Electrometric Titration
- ISO 3839
  Petroleum products – Determination of bromine number of distillates and aliphatic olefins – Electrometric method
- BS 2000-130
  Petroleum products – Determination of bromine number of distillates and aliphatic olefins
- IP 130
  Petroleum products – Determination of bromine number of distillates and aliphatic olefins
- DIN 51774-1
  Determination of bromine acceptance by electrometric Dead-Stop-method of samples with a bromine acceptance of more than 0,5 g/100 g (BA)
- GB/T 11135
  Standard test method for bromine numbers of petroleum distillates and commercial aliphatic olefins by electrometric titration
- UOP 304
  Bromine Number and Bromine Index of Hydrocarbons by Potentiometric Titration

Bromine index in aliphatic hydrocarbons

Instruments

- Titrator with DET Ipol and MET Ipol mode
- 10 mL buret
- Stirrer
- Thermostat
- Titration vessel with thermostat jacket

Electrodes

Double Pt-wire electrode for coulometry	6.0341.100
Pt1000 temperature sensor	6.1110.100

Reagents

- Potassium bromide, KBr, ≥ 99.0%
- Potassium bromate, $KBrO_3$, ≥ 99.8%
- Glacial acetic acid, CH_3COOH, ≥ 99.8%
- Methanol, CH_3OH, ≥ 99.8%
- Toluene, C_7H_8, ≥ 99.3%
- Hydrochloric acid, HCl conc., ≥ 37%
- Sulfuric acid, H_2SO_4 conc., 95.0 – 97.0%
- Potassium iodide, KI, ≥ 99.5%
- Sodium thiosulfate solution, $c(Na_2S_2O_3)$ = 0.1 mol/L

Solutions

Titrant	$c(Br_2)$ = 0.025 mol/L = $c(Br^-/BrO_3^-)$ = 0.05 mol/L KBr and $KBrO_3$ are dried for 30 min in a drying oven at 105 °C and allowed to cool down in a desiccator for at least 2 h. 5.1 g KBr and 1.4 g $KBrO_3$ are separately dissolved in 200 mL deionized water. Both solutions are poured into a 1000 mL volumetric flask and then filled up to the mark with deionized water.
Sulfuric acid	$w(H_2SO_4)$ = 16.7% 500 mL deionized water is added into a glass bottle. While stirring 100 mL conc. H_2SO_4 is slowly added and the solution is allowed to cool down to room temperature.

Sodium thiosulfate solution (0.05 mol/L)	Sodium thiosulfate solution $c(Na_2S_2O_3)$ = 0.05 mol/L 500 mL $c(Na_2S_2O_3)$ = 0.1 mol/L is added into a 1000 mL volumetric flask and is then filled up to the mark with deionized water.
Titration solvent	714 mL glacial acetic acid, 134 mL toluene, 134 mL methanol and 18 mL $w(H_2SO_4)$ = 16.7% are added into a 1000 mL glass flask and mixed well.
Potassium iodide solution	w(KI) = 15% 15.0 g KI is weighed into a 100 mL volumetric flask and dissolved in approximately 50 mL deionized water. The flask is then filled up to the mark with deionized water.

Sample preparation

No sample preparation is required.

Analysis

Titer

50 mL glacial acetic acid and 1 mL conc. HCl are added into the titration vessel. While stirring, the solution is cooled down for 10 min (thermostat set to 1 °C). Afterwards, 10 mL $c(Br_2)$ = 0.025 mol/L and 5 mL w(KI) = 15% are dosed into the titration vessel and the solution is stirred for further 5 min. Then, 50 mL deionized water is added and while continuing cooling the solution is titrated with $c(Na_2S_2O_3)$ = 0.05 mol/L until after the equivalence point.

After each titration, the titration vessel with thermostat jacket, the buret tips and the electrode are rinsed with deionized water.

Blank

110 mL titration solvent is added into the titration vessel and while stirring, the solution is cooled down to 4.5 °C, monitored with the Pt1000 temperature sensor. The solution is then titrated with $c(Br_2)$ = 0.025 mol/L until after the equivalence point.

After each titration, the titration vessel with thermostat jacket, the buret tips and the electrode are rinsed with titration solvent.

Sample

110 mL titration solvent is added into the titration vessel. An appropriate amount of sample (see table below) is added into the titration vessel and while stirring, the solution is cooled down to 4.5 °C, monitored with the Pt1000 temperature sensor. The solution is then titrated with $c(Br_2)$ = 0.025 mol/L until after the equivalence point.

The same rinsing procedure as for the blank determination is applied.

Table 3: Sample size in dependency of the expected bromine index

Bromine index in mg bromine/100 g sample	Sample weight in g
100 – 500	8 to 10
> 500 – 1000	4 to 8

Parameters

Titer

Mode	DET Ipol
Pause	30 s
Start volume	(Sample size – 0.5) mL
Stirring rate	15
Signal drift	30 mV/min
Min. waiting time	5 s
Max. waiting time	32 s
Meas. point distance	3
Min. volume increment	10 µL
Max. volume increment	100 µL
I(pol)	1.0 µA
Stop volume	10 mL
Stop EP	1
Volume after EP	0.5 mL
EP criterion	20
EP recognition	Greatest

Blank and sample

Mode	MET Ipol
Pause	60 s
Start volume	0 mL
Stirring rate	15
Signal drift	Off
Min. waiting time	30 s
Max. waiting time	30 s
Volume increment	0.020 mL
I(pol)	1.0 µA
Stop volume	Off
Stop measured value	100 mV
Stop EP	Off
EP criterion	30 mV
EP recognition	Greatest

Temperature control

Mode	MEAS T
Stirring rate	15
Measuring parameters	Time-controlled measurement
Measurement duration	10000 s
Stop measured value	4.5 °C

Calculation

Titer

$$f = \frac{V_{EP1} \times c_{Na2S2O3}}{V_{Br2} \times 2 \times c_{Br2}}$$

f:	Titer of titrant
V_{EP1}:	Titrant consumption until the first equivalence point in mL
$c_{Na2S2O3}$:	Concentration of sodium thiosulfate solution, $c(Na_2S_2O_3)$ = 0.05 mol/L
V_{Br2}:	Volume $c(Br_2)$ = 0.025 mol/L solution in mL
2:	Stoichiometric factor
c_{Br2}:	Concentration of bromine solution, $c(Br_2)$ = 0.025 mol/L

Blank

$$Blank = V_{EP1}$$

Blank:	Blank of the titration solvent in mL
V_{EP1}:	Titrant consumption until the first equivalence point in mL

Sample

$$BI = \frac{(V_{EP1} - Blank) \times c_{Br2} \times f \times M_{Br2} \times 100}{m_S}$$

BI:	Bromine index in mg bromine/100 g sample
V_{EP1}:	Titrant consumption until the first equivalence point in mL
Blank:	Blank of the titration solvent in mL
c_{Br2}:	Concentration of titrant, $c(Br_2)$ = 0.025 mol/L
f:	Titer of titrant
M_{Br}:	Molecular weight of bromine $M(Br_2)$ = 159.808 g/mol
100:	Conversion factor for g/g in mg/100g
m_S:	Sample size in g

Example determination

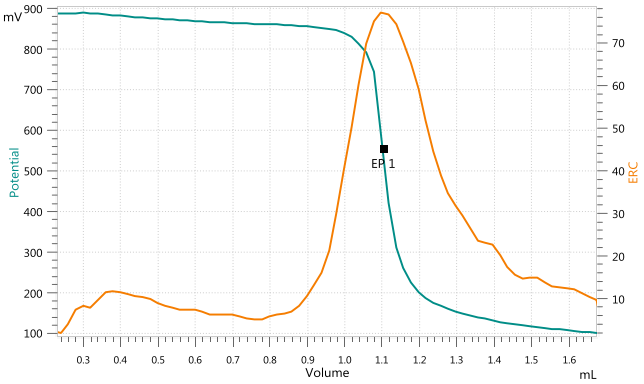

Fig. 2: Determination of the bromine index of xylene

Comments

- ASTM D2710 is suitable for the bromine index below 1000 mg bromine/100 g sample in aliphatic hydrocarbons.
- ASTM D2710 uses 1,1,1-trichloroethane or dichloromethane in the titration solvent. These chlorinated solvents should be replaced with toluene or diethyl carbonate.
- The standards IP 299 and GB/T 11136 are identical to ASTM D2710.
- The standard DIN 51774-2 is similar to ASTM D2710. The differences are:
  - Titration with $c(Br^-/BrO_3^-)$ = 0.02 mol/L
  - Titration solvent uses, beside other solvents methane trichloride, $w(H_2SO_4)$ = 20% instead of $w(H_2SO_4)$ = 16.7% and additionally 20 mg lithium chloride are added per litre.
  - Suitable for a bromine index between 5 and 500 mg bromine/100 g sample

- The standard UOP 304 is similar to ASTM D2710. However, UOP 304 is not recommended for the determination of the bromine index because its titration solvent contains mercuric chloride.
- The thermostat is set to 1 °C all the time.
- To be sure, that the temperature is between 0 °C and 5 °C, the solution temperature is monitored with a Pt1000 temperature sensor during the titration.

References

- ASTM D2710
  Standard Test Method for Bromine Index of Petroleum Hydrocarbons by Electrometric Titration
- GB/T 11136
  Petroleum hydrocarbons. Determination of bromine index. Electrometric titration.
- IP 299
  Determination of bromine index – Electrometric titration method
- DIN 51774-2
  Testing of liquid fuels; determination of bromine acceptance by electrometric Dead-Stop-method of samples with a bromine acceptance up to 0,5 g/100 g (BB)
- UOP 304
  Bromine Number and Bromine Index of Hydrocarbons by Potentiometric Titration

Bromine index in aromatic hydrocarbons

Instruments

- Titrator with DET Ipol and MET Ipol mode
- 10 mL buret
- Stirrer
- Thermostat
- Titration vessel with thermostat jacket

Electrodes

Double Pt-wire electrode for coulometry	6.0341.100
Pt1000 temperature sensor	6.1110.100

Reagents

- Potassium bromide, KBr, ≥ 99.0%
- Potassium bromate, $KBrO_3$, ≥ 99.8%
- Glacial acetic acid, CH_3COOH, ≥ 99.8%
- Methanol, CH_3OH, ≥ 99.8%
- 1-Methyl-2-pyrrolidinone, C_5H_9NO, ≥ 99.0%
- Hydrochloric acid, HCl conc., ≥ 37%
- Sulfuric acid, H_2SO_4 conc., 95.0 – 97.0%
- Potassium iodide, KI, ≥ 99.5%
- Sodium thiosulfate solution, c($Na_2S_2O_3$) = 0.1 mol/L

Solutions

Titrant	c(Br_2) = 0.05 mol/L = c(Br^-/BrO_3^-) = 0.1 mol/L KBr and $KBrO_3$ are dried for 30 min in a drying oven at 105 °C and allowed to cool down in a desiccator for at least 2 h. 10.1 g KBr and 2.8 g $KBrO_3$ are separately dissolved in 200 mL deionized water. Both solutions are poured into a 1000 mL volumetric flask and then filled up to the mark with deionized water.
Sulfuric acid	w(H_2SO_4) = 16.7% 500 mL deionized water is added into a glass bottle. While stirring 100 mL conc. H_2SO_4 is slowly added and the solution is allowed to cool down to room temperature.

Titration solvent	714 mL glacial acetic acid, 134 mL 1-methyl-2-pyrrolidinone, 134 mL methanol and 18 mL w(H_2SO_4) = 16.7% are added into a 1000 mL brown-glass flask and mixed well.
Potassium iodide solution	w(KI) = 15% 15.0 g KI is weighed into a 100 mL volumetric flask and dissolved in approximately 50 mL deionized water. The flask is then filled up to the mark with deionized water.

Sample preparation

No sample preparation is required.

Analysis

Titer

50 mL glacial acetic acid and 1 mL conc. HCl are added into the titration vessel. While stirring, the solution is cooled down for 10 min (thermostat set to 1 °C). Afterwards, 4 mL c(Br_2) = 0.05 mol/L and 4 mL w(KI) = 15% are dosed into the titration vessel and the solution is stirred for further 5 min. Then, 50 mL deionized water is added and while continuing cooling the solution is titrated with c($Na_2S_2O_3$) = 0.1 mol/L until after the equivalence point.

After each titration, the titration vessel with thermostat jacket, the buret tips and the electrode are rinsed with deionized water.

Blank

110 mL titration solvent is added into the titration vessel and while stirring, the solution is cooled down to 4.5 °C, monitored with the Pt1000 temperature sensor. The solution is then titrated with c(Br_2) = 0.05 mol/L until after the equivalence point.

After each titration, the titration vessel with thermostat jacket, the buret tips and the electrode are rinsed with titration solvent.

Sample

110 mL titration solvent is added into the titration vessel. An appropriate amount of sample (see table below) is added into the titration vessel and while stirring, the solution is cooled down to 4.5 °C, monitored with the Pt1000 temperature sensor. The solution is then titrated with c(Br_2) = 0.05 mol/L until after the equivalence point.

The same rinsing procedure as for the blank determination is applied.

Table 4: Sample size in dependency of the expected bromine index

Bromine index in mg bromine/100 g sample	Sample weight in g
0 – 20	50
20 – 100	30 to 40
100 – 200	20 to 30
200 – 500	8 to 10

Parameters

Titer

Mode	DET Ipol
Pause	30 s
Start volume	(Sample size – 0.5) mL
Stirring rate	15
Signal drift	30 mV/min
Min. waiting time	5 s
Max. waiting time	32 s
Meas. point distance	3
Min. volume increment	10 µL
Max. volume increment	100 µL
I(pol)	1.0 µA
Stop volume	20 mL
Stop EP	1
Volume after EP	0.5 mL
EP criterion	20
EP recognition	Greatest

Blank and sample

Mode	MET Ipol
Pause	60 s
Start volume	0 mL
Stirring rate	15
Signal drift	Off
Min. waiting time	30 s
Max. waiting time	30 s
Volume increment	0.020 mL
I(pol)	1.0 µA
Stop volume	Off
Stop measured value	100 mV
Stop EP	Off
EP criterion	30 mV
EP recognition	Greatest

Temperature control

Mode	MEAS T
Stirring rate	15
Measuring parameters	Time-controlled measurement
Measurement duration	10000 s
Stop measured value	4.5 °C

Calculation

Titer

$$f = \frac{V_{EP1} \times c_{Na2S2O3}}{V_{Br2} \times 2 \times c_{Br2}}$$

f:	Titer of titrant
V_{EP1}:	Titrant consumption until the first equivalence point in mL
$c_{Na2S2O3}$:	Concentration of sodium thiosulfate solution, $c(Na_2S_2O_3)$ = 0.1 mol/L
V_{Br2}:	Volume $c(Br_2)$ = 0.05 mol/L solution in mL
2:	Stoichiometric factor
c_{Br2}:	Concentration of bromine solution, $c(Br_2)$ = 0.05 mol/L

Blank

$$Blank = V_{EP1}$$

Blank:	Blank of the titration solvent in mL
V_{EP1}:	Titrant consumption until the first equivalence point in mL

Sample

$$BI = \frac{(V_{EP1} - Blank) \times c_{Br2} \times f \times M_{Br2} \times 100}{m_S}$$

BI:	Bromine index in mg bromine/100 g sample
V_{EP1}:	Titrant consumption until the first equivalence point in mL
Blank:	Blank of the titration solvent in mL
c_{Br2}:	Concentration of titrant, $c(Br_2)$ = 0.05 mol/L
f:	Titer of titrant
M_{Br}:	Molecular weight of bromine $M(Br_2)$ = 159.808 g/mol
100:	Conversion factor for g/g in mg/100g
m_S:	Sample size in g

Example determination

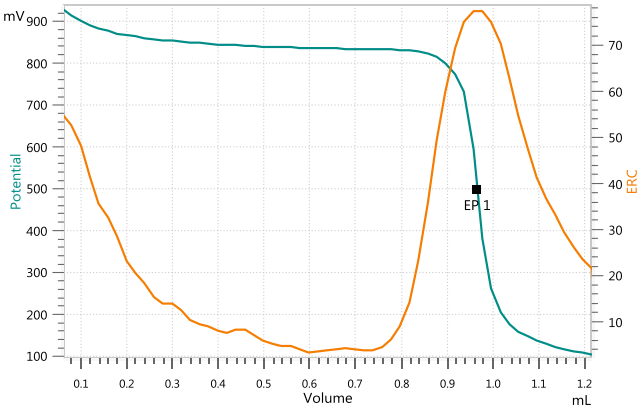

Fig. 3: Determination of the bromine index of xylene

Comments

- The standard ASTM D5776 is suitable for the bromine index in aromatic hydrocarbons.
- The standard SH/T 1767 is identical to ASTM D5776.
- The standard UOP 304 is similar to ASTM D5776. However, UOP 304 is not recommended for the determination of the bromine index because its titration solvent contains mercuric chloride.
- The ASTM D5776 requires a titration solvent volume of 150 mL. With this volume, the titration vessel would already be at the upper volume limit. Therefore, only 110 mL titration solvent is taken.
- The thermostat is set to 1 °C all the time.
- To be sure, that the temperature is between 0 °C and 5 °C, the solution temperature is monitored with a Pt1000 temperature sensor during the titration.
- 1-Methyl-2-pyrrolidinone is a photo sensitive chemical. It is recommended to store it in a brown-glass flask.

References

- ASTM D5776
  Standard Test Method for Bromine Index of Aromatic Hydrocarbons by Electrometric Titration
- SH/T 1767
  Determination of bromine index of aromatic hydrocarbons. Electrometric titration
- UOP 304
  Bromine Number and Bromine Index of Hydrocarbons by Potentiometric Titration

Date

December 2018

Author

Competence Center Titration

Metrohm International Headquarters