Acidity in Aviation Turbine Fuel in accordance with ASTM D 3242

Description

The acidity in aviation turbine fuel is titrated with a 0.01 molar potassium hydroxide solution using the optical indicator p-naphtholbenzein. The sample is dissolved in a mixture of toluene / isopropyl alcohol / water blanketed by a stream of nitrogen. The colour measured by the photometric sensor OptiLine 6 changes from orange to green.

Instruments

Titrator	TL 7000 or higher
Interchangeable unit	WA 10
Electrode	OptiLine 6
Stirrer	Magnetic stirrer TM 235
Lab accessory	Glass beaker 250 ml, tall form
	Glass beaker 100 ml, tall form
	Nitrogen, dry type, carbon dioxide free
	Titration head Z 306
	Magnetic stirring bars
	Balance (5 digits)

Reagents

1	KOH in 2-propanol, 0.01 mol/L
2	Toluene
3	Isopropyl alcohol
4	Deionized water
5	p-Naphtholbenzein indicator solution
6	Potassium acid phthalate
8	Phenolphthalein indicator solution
All reagents should be of reagent grade or better.	

Preparation of Reagents

Titration reagent

A 0.1 molar KOH in isopropyl alcohol solution is commercial available and diluted 1:10 with isopropyl alcohol to obtain a 0.01 molar concentration.

Titration solvent

Prepare by mixing toluene / isopropyl alcohol / water in the ratio 100 / 99/ 1.

Indicator solution p-naphtholbenzein

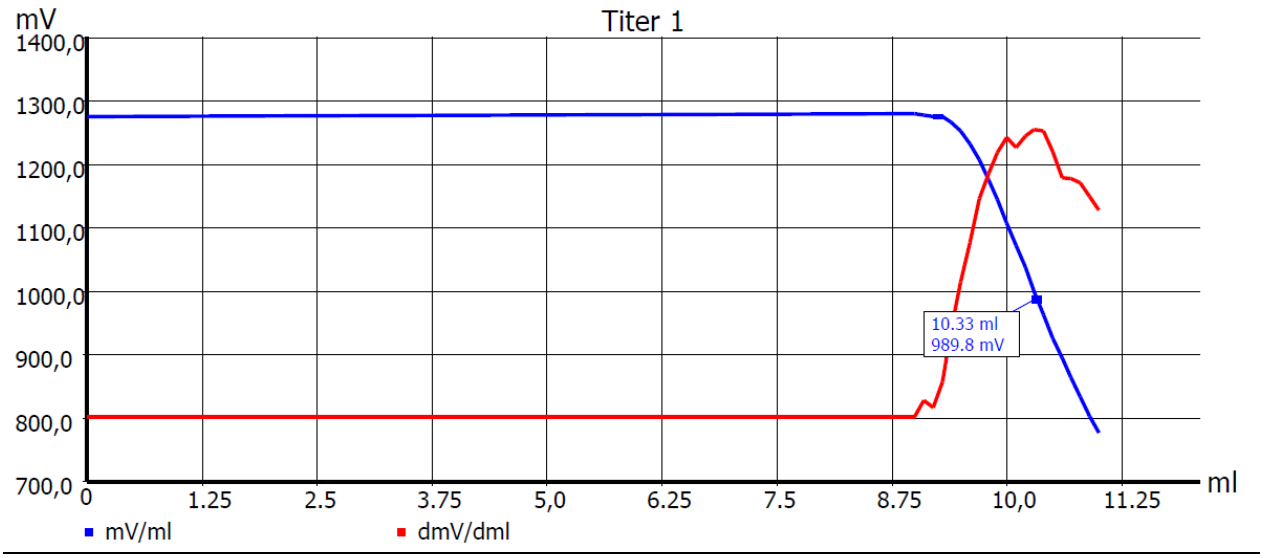
Prepare a solution of p-naphtholbenzein in titration solvent equal to 10 g/L.

Indicator solution Phenolphthalein

Prepare a solution of 0.1 +/- 0.01 mg of Phenolphthalein dissolved in a mixture of ethanol and water, each 50 ml.

Standardization of Potassium Hydroxide Solution

Weigh 0.02 g of potassium acid phthalate, which has been dried for at least 1 h at 110 °C, in a 100 ml beaker and dissolve in a small amount (max 20 mL) of water free of CO_2. After dissolving add 2-Propanol to the 60 ml mark of the beaker. Add 2-3 drops of the phenolphthalein indicator solution and titrate with linear titration steps to the inflection point. For highest accuracy repeat the titer determination two times and calculate the mean value using the statistic function of the titrator. The exact concentration T (normality) should be stored automatically on the exchangeable Unit (WA).



Default method	-		
Method type	Automatic Titration		
Mode	Linear		
Titration value	mV (E)		
Measuring speed	Individual	Minimum time	05 s
		Maximum time	15 s
		Measuring time	3 s
		Drift	10 mV/min
Initial waiting time	0 s	Wavelength	520 nm
Linear step size	0.1 ml	Intensity	average(approx. 1000 mV at the beginning)
		Smoothing	average
Pre-titration	9 ml		
End value	Off	Titration direction	decrease
EQ	On (1EQ)	Slope value	200
Max. titration volume	15 ml		
Dosing speed	100%	Filling speed	30 s

Calculation:

$$T\ [mol/l] = \frac{W * F2}{(EQ - B) * M * F1}$$

B	0	Blank value
W	man	Weight of the sample [g]
F2	1000	Conversion factor ml - l
EQ1		Consumption of titrant until first Equivalence point
M	204,22	Molecular mass
F1	1	Conversion factor

Blank value titration

Perform a blank titration using 100 ml of the solvent and add 0.1 mL of the p-naphtholbenzein indicator to the solution. The titration is carried out in 250 ml beaker tall form. Before the titration a stream of nitrogen is introduced into the solution and bubbled for three minutes. Before the titration is started the tip used to introduce the nitrogen is lifted above the solution. After waiting another 30 s the titration can be started.

Note: The waiting time for the nitrogen stream can be added as initial waiting time of 210 s. After 180 s the tip is the lifted manually above the surface of the solution, after 210 s the titration starts automatically.

Attention: The adapter TZ 1520 which is part of the titration head Z 306 needs to be shortened to assure that the OptiLine 6 is inserted fully into the solvent.

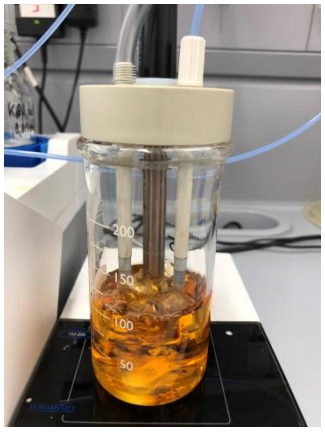


Fig. 1: Blank solution with introduced nitrogen stream

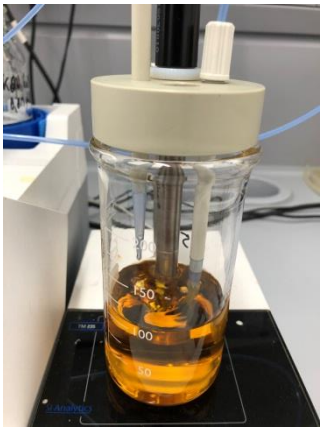


Fig. 2: Blank solution with nitrogen stream tip lifted above the surface

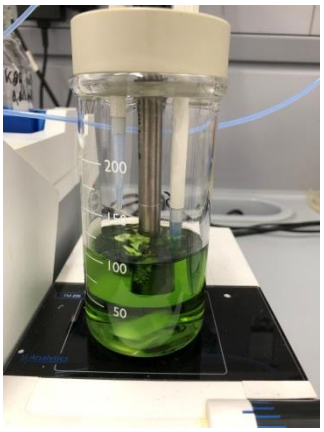
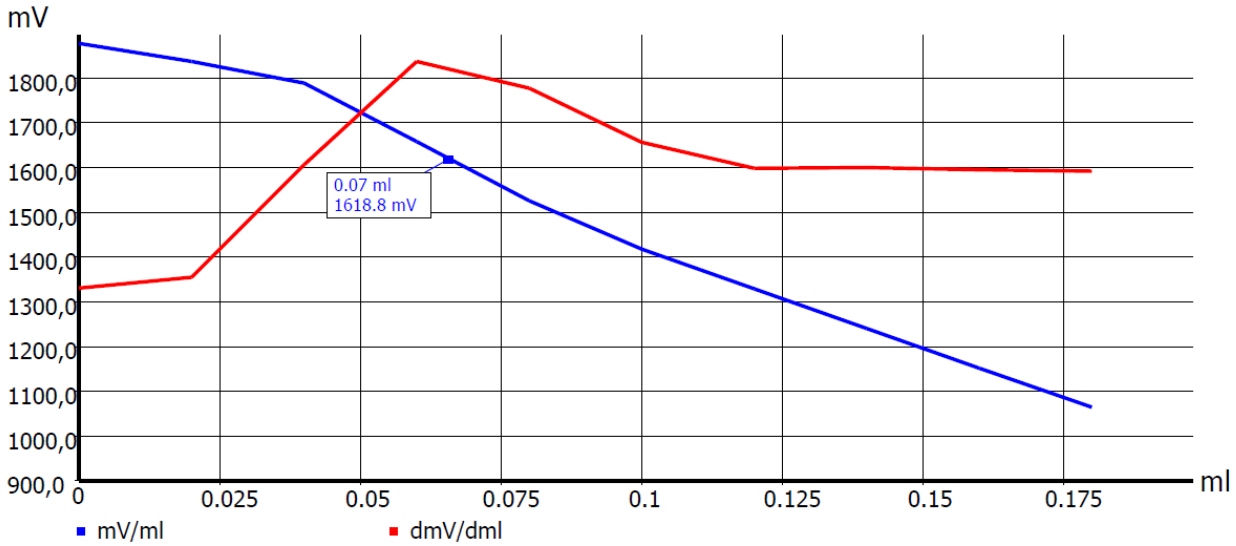


Fig. 3: Colour of the Blank solution at the end of the titration



Default method	-		
Method type	Automatic Titration		
Mode	Linear		
Titration value	mV (E)		
Measuring speed	Individual	Minimum time	10 s
		Maximum time	30 s
		Measuring time	4 s
		Drift	5 mV/min
Initial waiting time	10 s	Wavelength	625 nm
Linear step size	0.02 ml	Intensity	average(approx. 1000 mV at the beginning)
		Smoothing	Strong
Pre-titration	Off		
End value	Off	Titration direction	Decrease
EQ	Off	Slope value	-
Max. titration volume	0.4 ml		
Dosing speed	100%	Filling speed	30 s

Calculation:

$$Result\ ml = EQ1$$

EQ1		Consumption of titrant at the first Equivalence point

The result is stored as global variable M01.

Sample titration

Weigh 90 to maximum 95 g of the sample into a 250 ml beaker tall form. If more than 95 g of the sample are used the 250 ml titration beaker is too full. Add 100 ml of the solvent and 0.1 ml of the p-naphtholbenzein indicator. The nitrogen stream is introduced in the same way as described under blank titration.

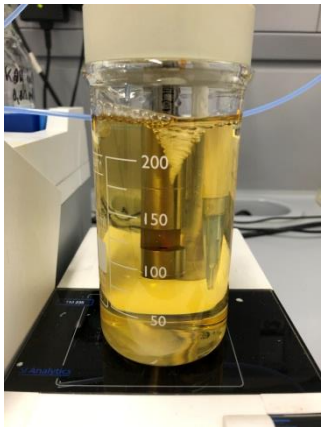


Fig. 3: Beginning of the sample titration with nitrogen stream already lifted above the solution

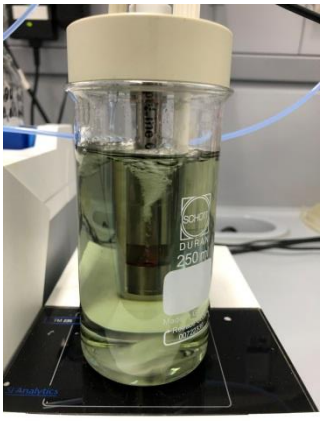
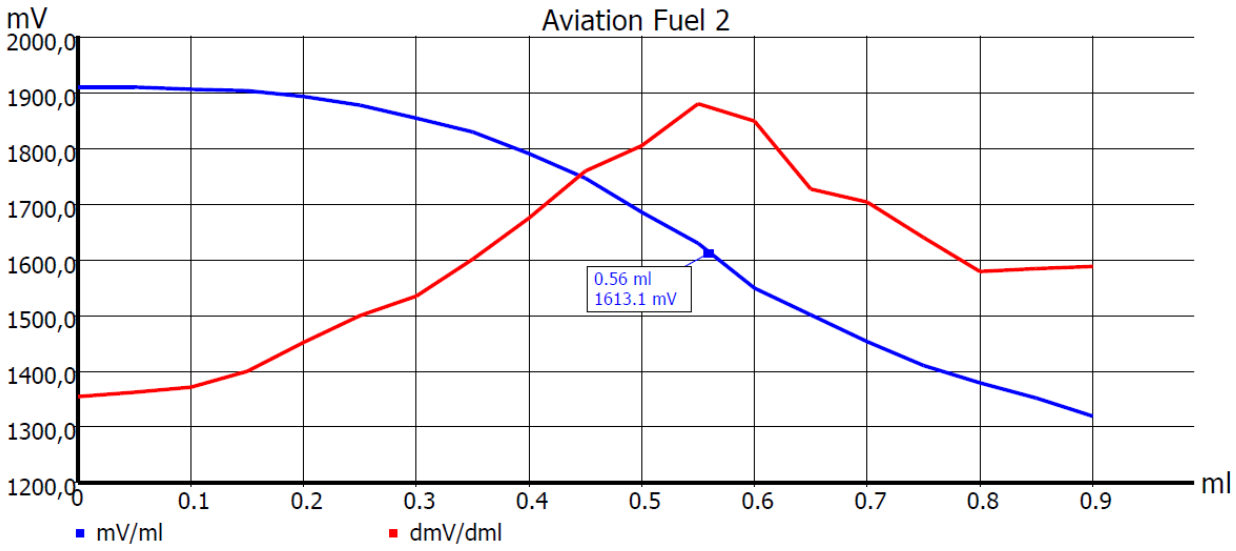


Fig. 4: End of the sample titration



Default method	-		
Method type	Automatic Titration		
Mode	Linear		
Titration value	mV (E)		
Measuring speed	Individual	Minimum time	10 s
		Maximum time	30 s
		Measuring time	4 s
		Drift	5 mV/min
Initial waiting time	30 s	Wavelength	625 nm
Linear step size	0.05 ml	Intensity	average(approx. 1000 mV at the beginning)
		Smoothing	Strong
Pre-titration	Off		
End value	Off	Titration direction	Decrease
EQ	On (1EQ)	Slope value	500
Max. titration volume	0.04 ml		
Dosing speed	100%	Filling speed	30 s

Calculation:

$$Result\ [mg\ KOH/g] = \frac{(EQ1 - B) * T * M * F1}{W * F2}$$

B	M01	Blank value
EQ1		Consumption of titrant at the first Equivalence point
T	WA	Actual Concentration of the titrant
M	56.1	Molecular weight
W	man	Sample weight in g
F1	1	Conversion factor 1
F2	1	Conversion factor 2

Any questions? Please contact the application team:

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