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Thermo. Titr. Application Note No. H-001

Title:	Determination of TAN in Oils

Scope:	Determination of Total Acid Number (TAN) values in mineral oils and similar fluids.

Principle:	Dissolve oil sample in mixture of toluene and propan-2-ol, add paraformaldehyde and titrate with 0.1M KOH in propan-2-ol. The endpoint is indicated by a strongly endothermic response caused by the base-catalyzed de-polymerization of paraformaldehyde.

Reagents:	0.1 mol/L KOH in iso-propanol (standardized)
	50% A.R. toluene : 50% A.R. propan-2-ol by volume
	A.R. paraformaldehyde fine powder (eg, Sigma-Aldrich cat. no. 158127)

Method:	Basic Experimental Parameters:
	Data rate (per second) 20
	Titrant delivery rate (mL/min.) 1
	No. of endothermic endpoints 1
	Data smoothing factor 50
	Procedure:
	Weigh accurately approximately 0.5 – 2 mL oil in a clean dry titration vessel (the aim is to obtain a titre of approx. 1 mL KOH). Add 30 mL of toluene/propan-2-ol mixture. Add ~0.5-0.6g paraformaldehyde (a level 1/8th kitchen teaspoon measure is ~0.5g). Titrate to an inflection characterized by a sudden reduction in temperature.

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	Analysis of a heavy vehicle hydraulic oil:		
Results:	Sample Mass, g	mL 0.1 mol/L KOH	TAN mg KOH/g sample
	1.7447	0.875	2.60
	1.8842	0.940	2.60
	1.9237	0.960	2.61
	1.8487	0.924	2.60
	1.8494	0.924	2.60
	1.4029	0.718	2.60
	0.9727	0.519	2.60
	0.5049	0.304	2.60
		Average	2.60
		Standard Deviation	0.002

Calculation:

TAN = mg KOH / g oil

$$\therefore TAN = \frac{\left((titre, mL - blank, mL) \times MKOH \times FWKOH \right)}{sample\, mass, g}$$

Example:

$$TAN = \frac{\left((0.940 - 0.071) \times 0.1006 \times 56.11 \right)}{1.8842} = 2.60$$

Thermometric Titration Plot:

Legend:

Red = solution temperature curve

Black = second derivative curve

Determination of titration blank or offset:

Determination of Titration Blank

$y = 0.46124x + 0.07050$
$R^2 = 1.00000$

mL 0.1 mol/L KOH in propan-2-ol (y-axis)

g hydraulic oil (x-axis)
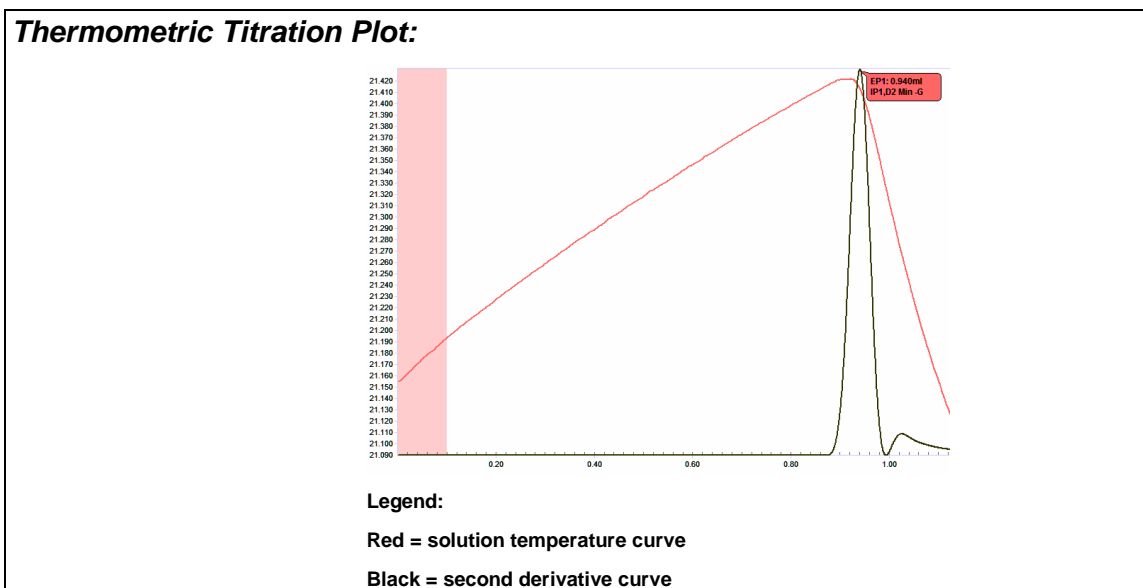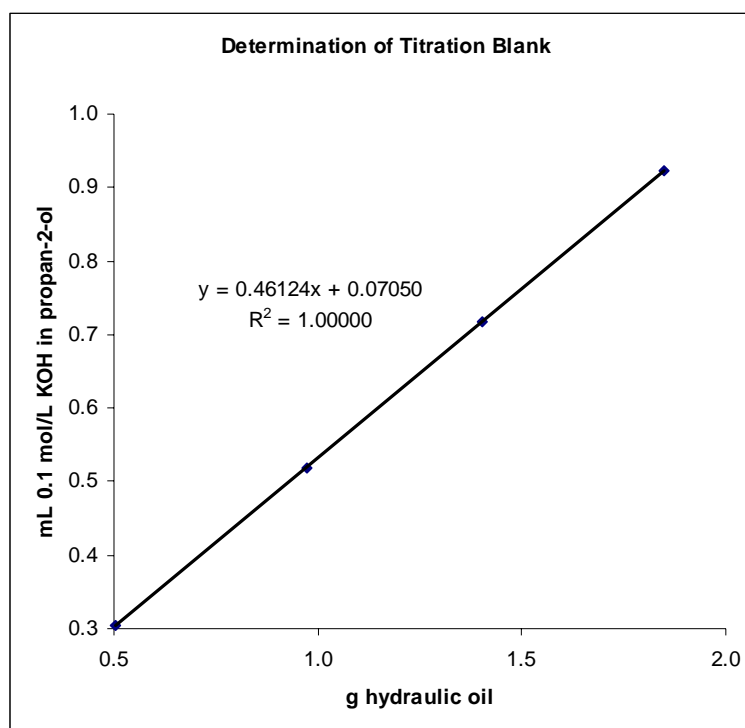
Titration blank or offset = y-intercept = 0.0705 mL (which is to be subtracted from each titre)