

Determination of Total acid number (TAN) according to ASTM 664

Description

Determination of acidic compounds in petroleum products and lubricants by potentiometric titration. The total acid number TAN is the quantity of base, expressed in milligrams of potassium hydroxide, which is required to neutralize all acidic constituents in 1 g of sample. The titration is done in a mixture of toluene, Isopropyl alcohol and water with KOH in Isopropyl alcohol. The use of Tetrabutylammonium hydroxide as titrant is also possible.

The result is calculated as $\text{mg}_{(\text{KOH})} / \text{g}$.

Instruments

| | |
|---------------|------------------------------------|
| Titration | TL 7000 or higher |
| Electrode | N 6480 eth |
| Cable | L 1 A |
| Stirrer | Magnetic stirrer TM 235 or similar |
| Lab accessory | glass beaker 150 ml |
| | Watch glass |
| | Magnetic stirrer bar 30 mm |

Reagents

| | |
|---|-----------------------------------|
| 1 | KOH 0,1 mol/l in Isopropylalcohol |
| 2 | Toluene |
| 3 | Isopropyl alcohol |
| 4 | Distilled water |
| All reagents should be of analytical grade or better. | |

Titration procedure

Reagents

KOH in Isopropyl alcohol 0.1 mol/l

It is recommended to use a ready 0.1 mol/l solution.

The solution must be protected against CO₂ with a CO₂ absorbent like soda lime.

The titer determination is done as described in the application note "Titer KOH".

Solvent mixture

500 ml Toluene, 495 ml Isopropyl alcohol and 5 ml water are mixed in a bottle.

Cleaning of the electrode

For cleaning and conditioning of the electrode 3 steps are necessary:

First the electrode is rinsed with the solvent mixture to remove residues of the sample.

Then it is conditioned in water.

After the conditioning step the electrode is rinsed with solvent mixture to remove the water.

The electrode is stored in a solution of 1.5 mol/l LiCl in Ethanol (or, if another electrolyte is used, in this electrolyte solution).

Blank value

For blank titration 125 ml solvent are placed in a 250 ml beaker and titrated with 0.1 mol/l KOH. The Blank should be below 0.3 ml.

Sample preparation

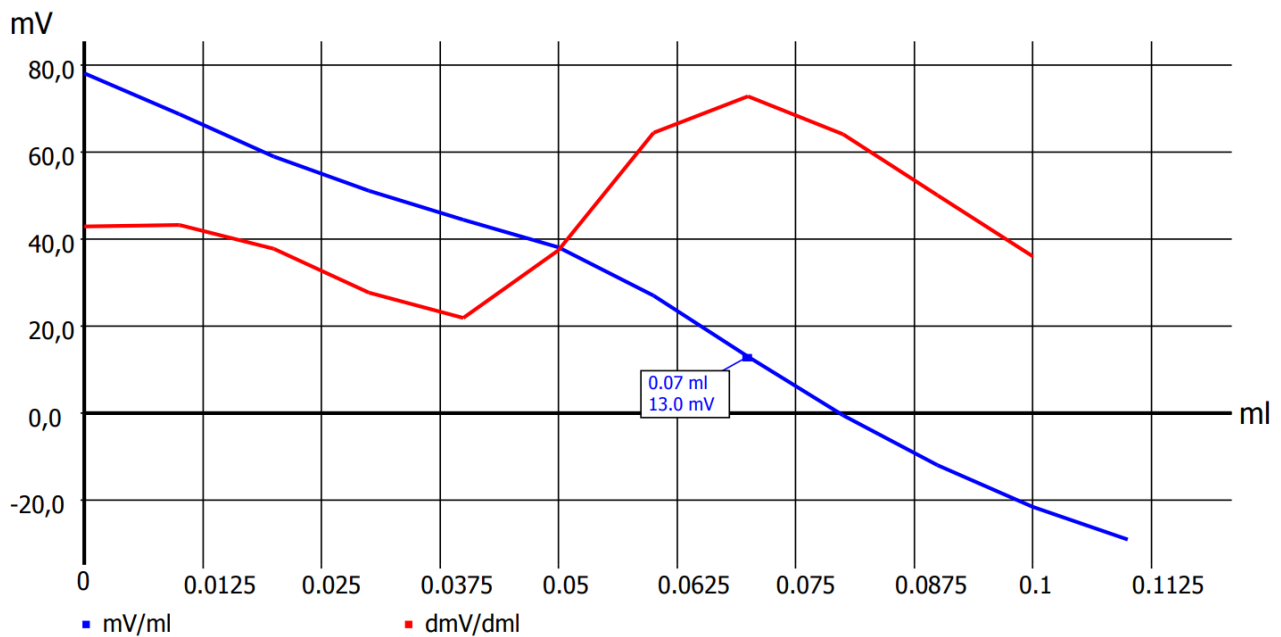
The sample is weighed into a 250 ml beaker, dissolved in 125 ml of the solvent and titrated with 0.1 mol/l KOH. The sample weight should be calculated and selected that the titration amount is not more than 4-5 ml because of the long titration time.

The required amount of sample can be estimated according to this rule of thumb:

$$W(g) = \frac{20}{\text{expected TAN}}$$

Titration parameter

Blank titration



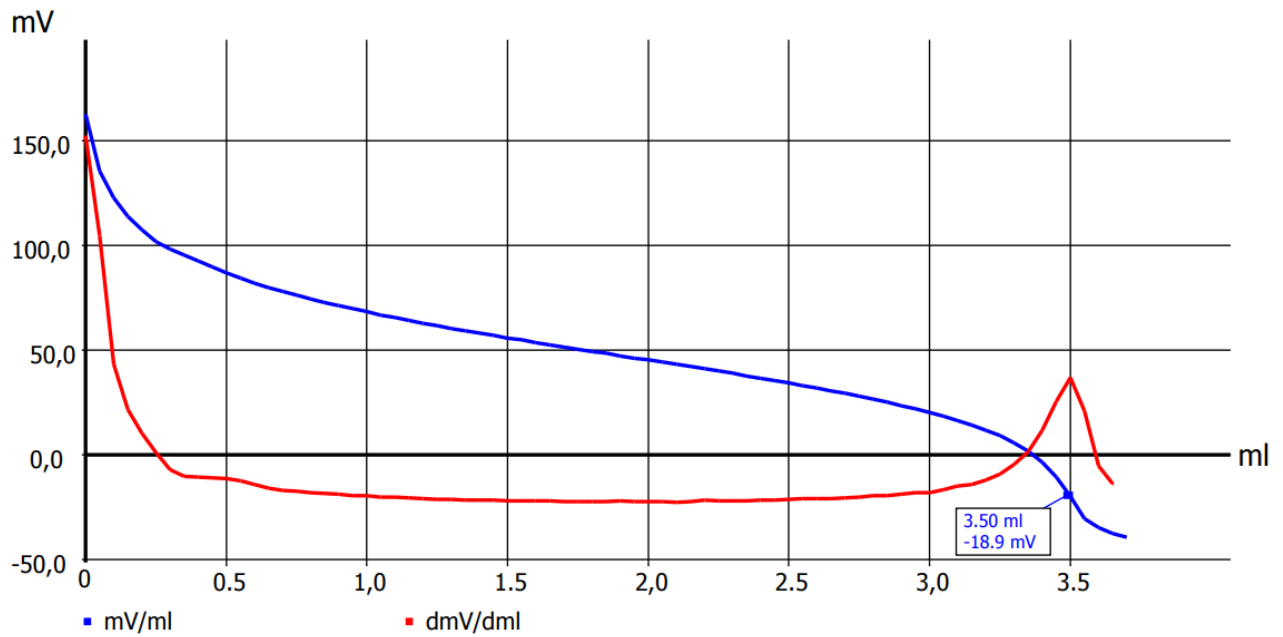
| | | | |
|-------------------------|---------------------|---------------------|----------|
| Default method | Blank TAN-TBN | | |
| Method type | Automatic titration | | |
| Modus | linear | | |
| Measured value | mV | | |
| Measuring speed / drift | User defined | Fixed delay time | 12 s |
| Initial waiting time | 10 s | | |
| Linear Steps | 0.01 ml | | |
| Damping | strong | Titration direction | decrease |
| Pretitration | off | Delay time | 0 s |
| End value | off | | |
| EQ | On (1) | Slope value | 60 |
| Max. titration volume | 10 ml | | |
| Dosing speed | 100% | Filling speed | 30 s |

Calculation:

$$ml = EQ1$$

The result is saved in a global memory, e.g. M01. We recommend to use statistics = 3.

Sample titration



| | | | |
|-------------------------|---------------------|----------------------|-----------|
| Default method | TAN ASTM 664 | | |
| Method type | Automatic titration | | |
| Modus | linear | | |
| Measured value | mV | | |
| Measuring speed / drift | User defined | Minimum holding time | 7 s |
| | | Maximum holding time | 20 s |
| | | Measuring time | 4 s |
| | | Drift | 10 mV/min |
| Initial waiting time | 10 s | | |
| Linear Steps | 0.05 ml | | |
| Damping | strong | Titration direction | decrease |
| Pretitration | off | Delay time | 0 s |
| End value | off | | |
| EQ | On (1) | Slope value | 120 |
| Max. titration volume | 6 ml | | |
| Dosing speed | 100% | Filling speed | 30 s |

For samples with very low TAN values the linear steps can be reduced to 0.02 or 0.01 ml.

Calculation:

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

| | | |
|-----|-------|---|
| B | M01 | Blank value, saved in global Memory M01 |
| EQ1 | | Consumption of titrant at first Equivalence point |
| T | WA | concentration of the titrant |
| M | 56,11 | Molecular mass |
| W | man | Weight of the sample in g |
| F1 | 1 | Conversion factor |
| F2 | 1 | Conversion factor |

Any questions? Please contact the application team:

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