Determination of the acid number in crude oil and gas oil as per ASTM D8045

The reliable knowledge of the accurate acid number for crude oil is important for the determination of the price of crude oil. Additionally, by monitoring the acidity of crude oil and the associated process oils unexpected shutdowns can be prevented and thus expensive treatment chemicals preserved. The determination of the acid number in crude oil and various gas oil samples by catalytic thermometric titration is described here.
Method description

Samples
• Desalted Crude
• Raw Crude
• Vacuum Light Gas Oil
• Vacuum Heavy Gas Oil
• Atmospheric Heavy Gas Oil
• 650 Endpoint Gas Oil

Sample preparation
Usually no sample preparation is needed. However, some samples may require slight warming or pre-dissolution in 10 mL of isomeric xylene prior to titration. It is possible to titrate warm samples (<60 °C) without a loss of resolution or precision.

Configuration
859 Titrotherm including:
1x 800 Dosino
1x 802 Rod stirrer
1x 804 Ti-Stand
1x 10 mL Dosing unit
1x Thermoprobe

800 Dosino
2.800.0010

50 mL Dosing Unit
6.3032.250

Reagents
Titrant
C(KOH) = 0.1 mol/L in IPA if possible this solution should be bought from a supplier.

Solvent
250 mL isopropanol and 750 mL isomeric xylene are mixed in a volumetric flask.

Paraformaldehyde
>95% pure, Sigma-Aldrich, 158127

Analysis
Blank determination
A linear regression of different sample sizes against titrant-consumption is performed. 3 – 9 g sample is weighed into the titration vessel and 30 mL solvent as well as 0.5 g paraformaldehyde are added. The solution is stirred thoroughly for 30 s before the titration with c(KOH) = 0.1 mol/L to a single exothermic endpoint is started.

Sample determination
3 – 9 g sample is weighed into the titration vessel and 30 mL solvent and 0.5 g paraformaldehyde are added. The solution is stirred thoroughly for 30 s before the titration with c(KOH) = 0.1 mol/L to a single exothermic endpoint is started.

Parameters
Pause 30 s
Stirrer rate 15
Dosing rate 2 mL/min
Filter factor 50 – 75*
Damping until 0.2 mL
Stop slope Off
Stop volume 2.5 mL
Added volume after stop 0.5 mL
Evaluation start 0 mL
End points Ex (exothermic)
EP criterion -50

* The filter factor depends on the sample and thus may vary. It is important that the same filter factor is used for the blank and sample determination.

Results
TAN in mg KOH / g sample (n = 8)

<table>
<thead>
<tr>
<th>Sample</th>
<th>TAN / (mg KOH / g sample)</th>
<th>s(rel) / %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desalted Crude</td>
<td>0.76</td>
<td>2.1</td>
</tr>
<tr>
<td>Raw Crude</td>
<td>0.73</td>
<td>1.1</td>
</tr>
<tr>
<td>Vacuum Light Gas</td>
<td>1.23</td>
<td>0.0</td>
</tr>
<tr>
<td>Vacuum Heavy Gas</td>
<td>1.25</td>
<td>0.8</td>
</tr>
<tr>
<td>Atmospheric Heavy Gas</td>
<td>1.15</td>
<td>1.2</td>
</tr>
<tr>
<td>650 Endpoint Gas</td>
<td>0.73</td>
<td>1.1</td>
</tr>
</tbody>
</table>

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