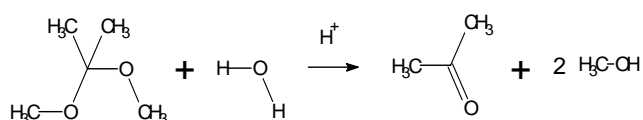


Thermo. Titr. Application Note No. H-011

Title: Determination of Total Solids Content of Drilling Fluids

Scope: Determination of total solids content of fluids employed in drilling oil and gas wells.

Principle: Titration of water content with acid-catalyzed 2,2-dimethoxypropane (DMP) to an endothermic endpoint. Water reacts endothermically with DMP to form acetone and methanol.



The percent total solids content (insoluble plus soluble solids) is estimated by subtracting the percent water from 100.

Reagents: 2M 2,2-dimethoxypropane (DMP) in dry (HPLC grade) cyclohexane [DMP data: FW = 104.15, d = 0.847, purity = 98%]. Dilute 250mL DMP to 1000mL with cyclohexane in a volumetric flask

Methane sulfonic acid

Propan-2-ol (HPLC grade)

Cyclohexane (HPLC grade)

Method: Basic Experimental Parameters:

Data rate (per second)	10
Titration delivery rate (mL/min.)	2
No. of exothermic endpoints	1
Data smoothing factor	75

Procedure:

Mix drilling fluid slurry very well and sample immediately. Weigh accurately approximately 2g drilling fluid into a clean, dry titration vessel. Deliver 10mL dry propan-2-ol and 15mL cyclohexane (both by bulb pipette) into the vessel, together with 250µL methane sulfonic acid. Titrate with 2M 2,2-dimethoxypropane in cyclohexane to an endothermic endpoint.

Determine the reagent blank by titrating 10mL propan-2-ol and 15mL cyclohexane (both from the same batches), catalysed with 250µL methane sulfonic acid

Results:

Analysis of formulated drilling fluids for North Sea exploration:

Sample	Mass, g	Titre, mL	%H ₂ O	%Total Solids
Sample A	2.6092	4.957	65.7	34.3
	1.9286	3.739	65.8	34.2
Sample B	2.1726	5.251	83.9	16.1
	1.5576	3.859	84.3	15.7
Sample C	1.8274	3.250	59.7	40.3
	1.9936	3.514	59.6	40.4
Sample D	2.3596	3.989	57.7	42.3
	2.4098	4.084	57.9	42.1

Calculation:

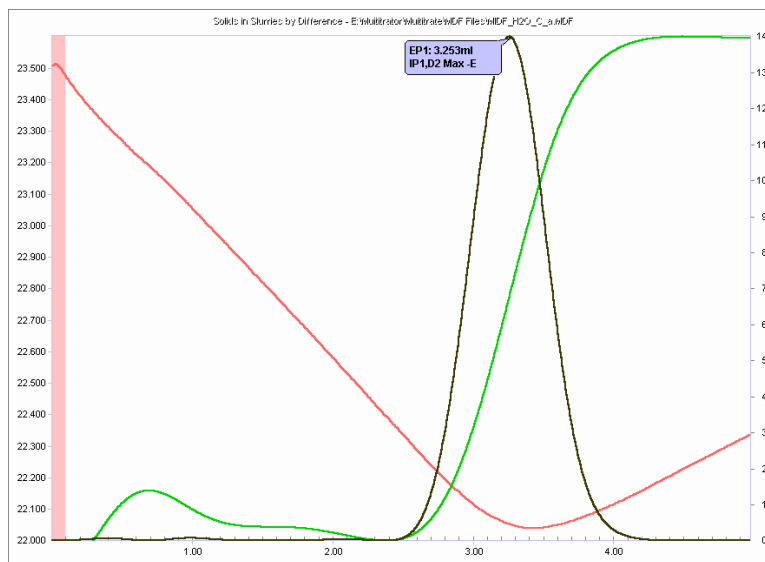
$$\% H_2O = \frac{((Titre - blank) \times FW H_2O \times M DMP \times 100)}{(sample\ mass \times 1000)}$$

$$\% H_2O = \frac{((3.250 - 0.271) \times 18.015 \times 2.0319 \times 100)}{(0.271 \times 1000)}$$

$$= 59.7\%$$

$$Total\ solids = 100 - 59.7 = 40.3\%$$

Thermometric Titration Plot:



Legend:

Red = solution temperature curve

Green = first derivative curve

Black = second derivative curve