Thermo. Titr. Application Note No. H-029

Title:	**Determination of Free Fatty Acids in Edible Fats and Oils**

***Scope*:**	Determination of Free Fatty Acid values in edible fats and oils.

***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 strong endothermic response caused by the base-catalyzed de-polymerization of paraformaldehyde. Reference: 1. M. J. D. Carneiro, M. A. Feres Júnior, and O. E. S. Godinho. Determination of the acidity of oils using paraformaldehyde as a thermometric end-point indicator. *J. Braz. Chem. Soc.* **13** (5) 692-694 (2002)

Reagents:	0.1 mol/L KOH in propan-2-ol (standardized) Paraformaldehyde (eg, Sigma-Aldrich cat. no. 158127) 50% A.R. toluene:50% A.R.propan-2-ol

Method:	Basic Experimental Parameters:	
	Titrant delivery rate (mL/min.)	2
	No. of exothermic endpoints	1
	Data smoothing factor	60
	Stirring speed (802 stirrer)	5
	Delay before start (secs.)	3
	Weigh accurately approximately 0.5 – 10 mL of just melted fat or oil in a clean dry 150mL titration beaker (*choose a mass to obtain a titre of ~0.2- 2mL KOH*). Add 35mL 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.	

Example Results:	**% Free Fatty Acid w/w**			
**AOCS manual titrations were performed by the laboratory of the company supplying the samples. Sample masses equivalent to 1/10th the formula weight of the acid species to be analyzed were dissolved in near boiling propan-2-ol and titrated with 0.1mol/L NaOH*	**Sample I.D.**	**Thermo. PFO Method**	***AOCS Manual Titration***	**Calculation Basis (acid species)**
	0817AT	26.08±0.08, n=5	25.70	Oleic acid, FW = 282
	0817BT	0.263, 0.263	0.26	
	0817CT	1.556, 1.558	1.54	
	0817DT	8.33, 8.35	8.25	
	0817ET	9.12, 9.10	9.00	
	0817FT	31.72, 31.72	31.65	

Calculation:

$$\%FFA = \frac{((mL\ titre - mL\ blank) \times M\ KOH \times FW\ acid \times 100)}{(sample\ mass, g \times 1000)}$$

Thermometric Titration Plot:

Legend:

Red = solution temperature curve

Black =second derivative curve