

Application Note AN-H-076

Determination of the iodine value in fats and oils

Fast and reliable analysis of oil products by thermometric titration

The iodine value is a benchmark for the quality control of fats and oils. It is a measure of the total number of double bonds (or degree of unsaturation) present in these oils. The double bonds react with an excess of Wijs solution. Iodine is formed in this chemical reaction, and its concentration is determined with sodium thiosulfate in a thermometric back-titration. The iodine number is expressed as the number of grams of iodine per 100 grams of sample.

Thermometric titration (TET) is a reliable method for the analysis of the iodine value. During thermometric titration, the enthalpy change of the reaction is monitored rather than the potential. The titration endpoint is revealed by an inflection in the temperature curve. The titrant is added at a constant rate, meaning TET is very fast in comparison to potentiometry.

SAMPLE AND SAMPLE PREPARATION

This application is demonstrated on two standardized solutions: cyclohexene and castor oil with a known iodine value.

Usually, sample preparation is not required for the iodine value titration method.

EXPERIMENTAL

The determinations are carried out on an OMNIS Professional Titrator equipped with a dThermoprobe (Figure 1). To avoid manually handling chemicals, solutions can be automatically added using OMNIS Dosing Modules.
Before the iodine value method is started, the titer and the method blank are determined.



Figure 1. OMNIS Professional Titrator equipped with a dThermoprobe and a rod stirrer.

For the iodine value determination, an appropriate amount of sample is weighed into the titration vessel. Then, cyclohexene, $Mg(OAc)_2$, glacial acetic acid, Wijs solution, and KI are added. While stirring, the solution is titrated until after the first exothermic endpoint with standardized sodium thiosulfate (Figure 2).

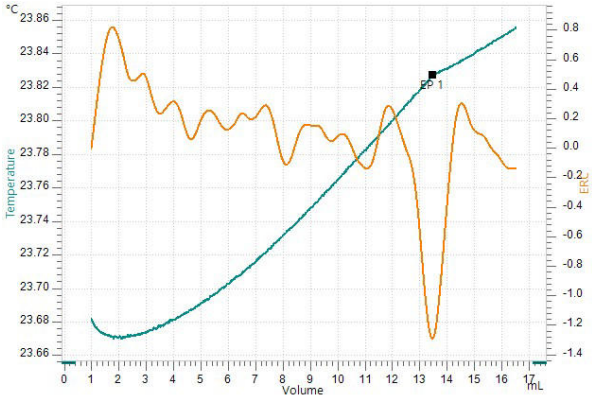


Figure 2. Titration curve of the thermometric determination of cyclohexene.

RESULTS

This method offers repeatable results for the iodine value (IV) as displayed in Table 1.

Table 1. Results for the thermometric iodine value determination with an OMNIS system.

IV (n = 3)	Mean in g I_2 / 100 g sample	RSD in %
Cyclohexene	290.63	0.62
Castor oil	81.83	0.17

CONCLUSION

Thermometric titration is a very fast method to determine the IV of oil products using a back-titration. No sensor maintenance is required, making TET a robust alternative to potentiometric titration methods.

CONTACT

Metrohm SA
1 Bridle Close
2052 Woodmead
sales@metrohm.co.za

CONFIGURATION



OMNIS Titrator with magnetic stirrer, without function license

Innovative, modular potentiometric OMNIS Titrator for stand-alone operation or as the core of an OMNIS titration system. Thanks to 3S Liquid Adapter technology, handling chemicals is more secure than ever before. The titrator can be freely configured with measuring modules and cylinder units and can have a stirrer added as needed. Thanks to various software function licenses, various measuring modes and functionalities are possible.

- Control via PC or local network
- Connection option for up to four additional titration or dosing modules for additional applications or auxiliary solutions
- Connection option for one rod stirrer
- Various cylinder sizes available: 5, 10, 20 or 50 mL
- Liquid Adapter with 3S technology: Secure handling of chemicals, automatic transfer of the original reagent data of the manufacturer

Measuring modes and software options:

- Endpoint titration: "Basic" function license
- Endpoint and equivalence point titration (monotonic/dynamic): "Advanced" function license
- Endpoint and equivalence point titration (monotonic/dynamic) with parallel titration: "Professional" function license

OMNIS

A WHOLE NEW LEVEL OF PERFORMANCE

Function license Thermometric Titrator

Function license "Thermometric Titrator" for the OMNIS Titrator

Contains the function modes

- Thermometric Titration (TET)
- MEAS U/T/pH
- Liquid Handling
- Titration only with internal buret of an OMNIS Titrator



dThermoprobe

High-sensitivity digital temperature sensor for thermometric titration with OMNIS.

The Thermoprobe has a short response time and a high resolution, which enables precise recording of even the smallest temperature changes.

This sensor can be used in aqueous and nonaqueous solutions which do not contain any HF, for determinations such as:

- Acid number (TAN) in accordance with ASTM D8045
- Total base number (TBN)
- Free fatty acids
- Ca/Mg determination
- Phosphate



Cylinder unit OMNIS special, 10 mL

Intelligent 10 mL cylinder unit for one OMNIS Titrator, Titration Module or Dosing Module. This cylinder unit is especially recommended for the following solutions:

- Aqueous alkaline solutions
- Titrant 5
- Silver nitrate solutions
- Nonaqueous alkaline solutions
- Permanganate solutions
- EDTA solutions

Includes dosing tubing and antidiffusion tip.