Application Note AN-T-112

Acid value and free fatty acids in edible oils

Fully automated determination according to the current EN ISO, Ph. Eur, and USP standards

The acid value and the free fatty acid content are important parameters used for the characterization and the quality assessment of edible fats and oils. Furthermore, the content of free fatty acids is used for purity testing and allows in certain cases conclusions about the pretreatment or occurring decomposition reactions. The higher the acid value and free fatty acid content, the lower the quality of the oil. The acid value additionally increases with the age of an oil as triglycerides decompose into fatty acids and glycerol as an effect of time. This Application Note describes the titrimetric determination of the acid value and the free fatty acid content in different edible oils. The method is based on the standards EN ISO 660, USP<401>, and Ph. Eur. 2.5.1. Using the DIS-Cover technique, all sample preparation steps can be fully automated, freeing up valuable time of the operator and thus increasing the productivity in the lab.

Find more information in the video:

SAMPLE AND SAMPLE PREPARATION

The method is demonstrated for different edible oils: canola (rapeseed) oil, palm oil, sunflower oil, and olive oil. For all samples, no sample preparation is necessary.

EXPERIMENTAL

This analysis is performed on an automated system consisting of an OMNIS Advanced Titrator and an OMNIS Sample Robot S with Dis-Cover equipped with a dSolvotrode.

To a reasonable amount of sample, a solvent mixture consisting of ethanol and diethyl ether is automatically added, and the solution is stirred for one minute to dissolve the sample. Afterwards, the sample is titrated with standardized ethanolic KOH until after the equivalence point.

Figure 1. Fully automated OMNIS system for the determination of acid value in edible oils.

RESULTS

The analysis demonstrates acceptable results and well-defined titration curves. The SD(rel) is a bit high with max. 5.3%, however, this corresponds to a SD(abs) of approx. 8.5 µg KOH/g sunflower oil or 4.4 µg KOH/g canola oil, respectively. The results are displayed in Table 1.

Table 1. Mean acid value and free fatty acids expressed as oleic acid (canola oil, olive oil, sunflower oil) or palmitic acid (palm oil) for edible oils determined with an automated OMNIS system (n = 5).

	Acid value in mg KOH/g	Free fatty acids in %	SD(rel) %
Canola oil	0.11	0.05	4.0
Olive oil	0.41	0.21	2.0-
Palm oil	11.6	5.3	0.2
Sunflower oil	0.16	0.08	5.3

CONCLUSION

Titration is a precise and reliable method to determine the acid value and free fatty acids in various edible oils according to various international standards.
Using an OMNIS Sample Robot with Dis-Cover functionality allows a fully automated determination of up to four samples in parallel, freeing up valuable time of the operator and thus increasing the productivity in the lab. The OMNIS system offers the opportunity to customize the system according to your needs, and expand it for other required titration applications on edible oils, such as the peroxide value or iodine value.

Internal reference: AW TI CH1-1278-062019

CONTACT

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CONFIGURATION

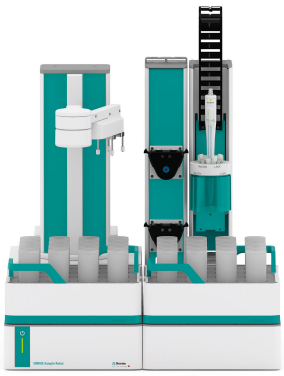
OMNIS Professional Titrator without stirrer

Innovative, modular potentiometric OMNIS Titrator for endpoint titration and equivalence point titration (monotonic/dynamic). Thanks to 3S Liquid Adapter technology, handling chemicals is safer than ever before. The titrator can be freely configured with measuring modules and cylinder units and can have a stirrer added as needed. Including "Professional" function license for parallel titration with additional titration or dosing modules.

- Control via PC or local network
- Connection option for up to four additional titration or dosing modules for additional applications or auxiliary solutions
- Can be supplemented with magnetic stirrer and/or rod stirrer
- Various cylinder sizes available: 5, 10, 20 or 50 mL
- Liquid Adapter with 3S technology: Safe handling of chemicals, automatic transfer of the original reagent data from 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 Sample Robot S Pick and Place

OMNIS Sample Robot S with a "Peristaltic" (2-channel) pump module and a Pick&Place module in addition to extensive accessories for the direct transition to fully automatic titration. The system provides space in two sample racks for 32 sample beakers of 120 mL each. This modular system is supplied completely installed and can thus be put into operation in a very short time.

The system can also be extended upon request to include two additional peristaltic pumps and another Pick&Place module, thus doubling the throughput. If additional workstations are required, then this Sample Robot is already able to be expanded to become an L-sized OMNIS Sample Robot, thus enabling samples from seven racks to be processed in parallel on up to four Pick&Place modules and quadrupling the sample throughput.

dSolvotrode

Digital, combined pH electrode for OMNIS for all non-aqueous acid/base titrations. The glass membrane is optimized for poorly conducting solutions and thanks to the flexible ground-joint diaphragm, the electrode is suitable for contaminated samples.
This electrode can be used with non-aqueous reference electrolytes (lithium chloride or tetraethylammonium bromide).
Storage in corresponding reference electrolyte.
dTrodes can be used on OMNIS Titrators.