Application Note AN-R-030

Oxidation stability comparison of AOCS Cd 12b-92 and EN ISO 6886

No difference found between Metrohm method and norms

The two most commonly used norms for determining the oxidation stability (also called oxidation stability index, or OSI) of animal fats and vegetable oils are AOCS Cd 12b-92 and EN ISO 6886. The standard method recommended by Metrohm for this is based on EN ISO 6886.

This Application Note describes the determination and comparison of the sunflower oil oxidative stability index according to AOCS Cd 12b-92, EN ISO 6886, and the recommended method from Metrohm with an 892 Professional Rancimat.

Despite different parameters used in the norms and in the Metrohm method, it is shown that there is no significant difference found between the results of these experiments.

In addition, the oxidation stability of cooking oils like olive oil (refined and native), canola oil (rapeseed oil), corn oil, safflower oil, peanut oil, and walnut oil was measured using the Metrohm method based on EN ISO 6886.

SAMPLE AND SAMPLE PREPARATION

The sunflower oil sample is measured directly with the Rancimat without any preparation steps for the comparison of all standards and the Metrohm method.

Extra virgin olive oil, refined olive oil, canola oil (rapeseed oil), corn oil, safflower oil, peanut oil, and walnut oil were also tested without sample preparation with the Metrohm method.

EXPERIMENTAL

For the analysis, an appropriate amount of raw sunflower oil is weighed into the reaction vessel and the analysis is started.

The Rancimat method exposes the sample to an airflow at a constant temperature of 100–180 °C (Figure 1). Highly volatile secondary oxidation products are transferred into the measuring vessel with the airflow where they are absorbed in the measuring solution. Here, the conductivity is continuously registered. The formation of secondary oxidation products leads to an increase in the conductivity.

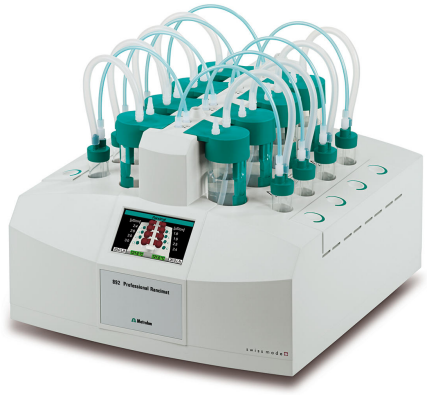

Figure 1. The 892 Professional Rancimat is equipped with measuring and reaction vessels for the determination of oxidation stability.

The time until occurrence of this marked conductivity increase is referred to as the «induction time», which is a good indicator for the oxidation stability (Figure 2).

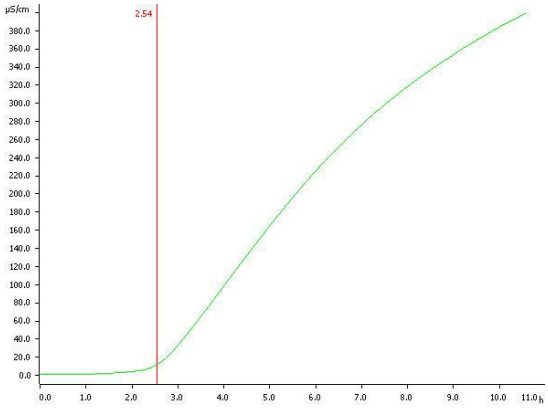

Figure 2. Determination of the oxidation stability of sample 4. Induction time is determined at 2.54 h.

Table 1. Overview of the different measuring parameters for the samples. Sample 1 is prepared with 60 mL measuring solution, and samples 2–6 are made with 50 mL measuring solution.

Sample	According to	Sample size (g)	Gas flow (L/h)
1	Metrohm	3.00 ± 0.01	20.0
2	EN ISO 6886	3.00 ± 0.01	10.0
3	AOCS Cd 12b-92	2.50 ± 0.01	9.0
4	AOCS Cd 12b-92	5.00 ± 0.01	9.0
5	AOCS Cd 12b-92	2.50 ± 0.01	20.0
6	AOCS Cd 12b-92	5.00 ± 0.01	20.0

Table 2. Results of the oxidation stability of sunflower oil with the 892 Professional Rancimat. Determinations were carried out in quadruplicate for each parameter set mentioned in the norms.

Sample (n = 4)	Mean value (h)	SD(abs) in h	SD(rel) in %
Sample 1	2.57	0.05	1.8
Sample 2	2.51	0.06	2.4
Sample 3	2.53	0.08	3.4
Sample 4	2.51	0.04	1.5
Sample 5	2.75	0.06	2.1
Sample 6	2.56	0.04	1.5

Table 3. Summary of results for the oxidation stability of a selection of different edible oils with the 892 Professional Rancimat. Quadruplicate determinations were carried out for each oil type at 120 °C.

Sample (n = 4)	Mean value (h)	SD(abs) in h	SD(rel) in %
Olive oil, refined	9.51	0.15	1.6
Olive oil, native	10.49	0.06	0.6
Canola oil	3.40	0.11	3.2
Corn oil	5.47	0.09	1.6
Safflower oil	2.01	0.05	2.5
Peanut oil	14.65	0.20	1.4
Walnut oil	1.99	0.07	3.5

CONCLUSION

A mean value induction time of 2.57 h is found over all samples (n = 24), with SD(abs) = 0.06 h and SD(rel) = 2.1%. These values meet both the repeatability and the reproducibility requirements listed in AOCS Cd 12b-92 and ISO 6886.

Furthermore, all demonstrated methods delivered acceptable values for all samples with SD(rel) ≤ 10% (Table 2).

With the Metrohm method, oxidation stability of different edible oils can be tested easily and precisely. Comparison with the AOCS official method Cd 12b-92 and ISO 6886 shows that the values are comparable and reliable for example monitoring the oxidative stability of oils and fats in oil production.

In general, the oxidation stability of most vegetable fats and oils can be measured directly with the Rancimat. In particular, the oxidation stability of olive oil is considered quite an important quality parameter. The Rancimat can determine this oxidation stability easily and simultaneously for up to eight samples at a time.

Internal reference: AW ST CH-0177-082022

CONTACT

Metrohm ANZ
56 Buffalo Road
2111 Gladesville
info@metrohm.com.au

CONFIGURATION

892 Professional Rancimat

The 892 Professional Rancimat is an analysis system for the simple and safe determination of the oxidation stability of natural fats and oils with the well-established Rancimat method. With eight measuring positions in two heating blocks. The built-in display shows the status of the instrument and each individual measuring position. Start buttons for every measuring position enable the measurement start on the instrument. Cleaning effort can be reduced to a minimum through the use of practical disposable reaction vessels and dishwasher-safe accessories. This saves time and costs and significantly improves accuracy and reproducibility.

All accessories necessary for carrying out determinations are included in the scope of delivery. The StabNet software is required for instrument control, data recording and evaluation and for data storage.

Equipment for determination of temperature correction with Rancimats and PVC Thermomats.

Set for exact temperature adjustment

Measuring vessel cover for stability measuring instruments

With built-in conductometric measuring cell.