Application Note AN-R-032

Oxidation stability of sausages after cold extraction

Specific and accurate determination of the cold-extracted fat

Meat products, especially sausages, consist of many components. Aside from fat, water, protein, salts, and spices, sausages also contain stabilizers and antioxidants.

In order to measure the sausage oxidation stability of the fat contained and therefore draw conclusions about its shelf life, the fat must be extracted beforehand. This extraction must not be carried out at high temperatures, as this would falsify the oxidation stability results. Solvents must also be used that do not change the chemical properties of the fat and that can be easily removed after extraction.

By using petroleum ether, the fat from sausages can be extracted easily. Analyzing these extracted fats gives some information about the lipid oxidation.

This Application Note describes the determination of the oxidation stability of different sausages with the recommended cold extraction method from Metrohm with an 892 Professional Rancimat.

SAMPLE AND SAMPLE PREPARATION

This application is demonstrated on cervelat and bratwurst sausages.

First, the sausage skin is removed, and the sausage is cut into smaller pieces. These pieces are put into a 250 mL round bottom flask.

Afterwards, about three times the amount (by weight) of low-boiling petroleum ether is added (boiling point 30–40 °C). A stir bar is carefully added, and the extraction is performed by moderate stirring for at least one hour (Figure 1).

In order to shorten the extraction time and increase the fat yield, the sausage can be more finely ground using a suitable polytron.

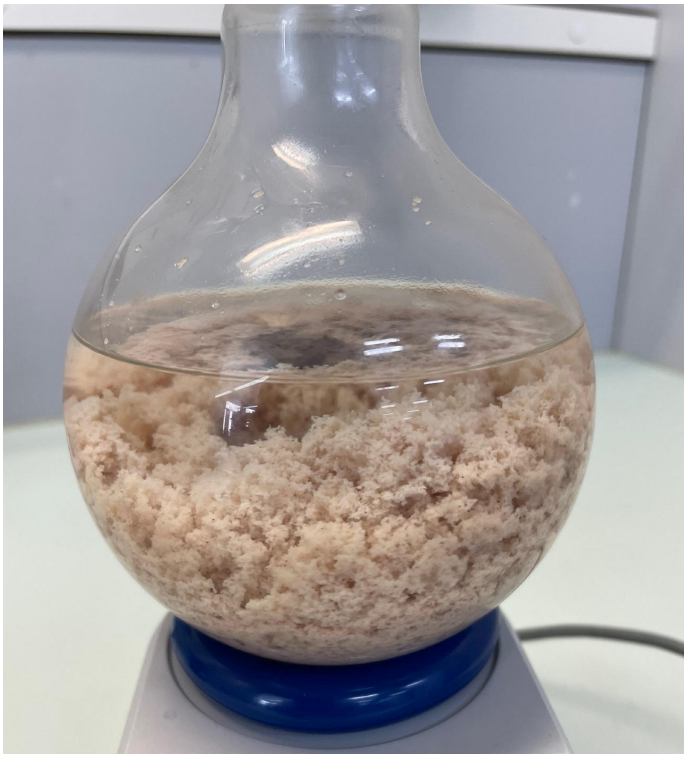

Figure 1. Chopped sausage sample in a 250 mL round bottom flask filled with low-boiling petroleum ether (boiling point 30–40 °C) and a small magnetic stir bar.

After extraction, the ether phase is poured through a pleated paper filter into a separate 250 mL round bottom flask. The petroleum ether is then distilled, e.g., using a rotavapor. The vacuum is gradually reduced until all solvent is removed at 15 mbar.

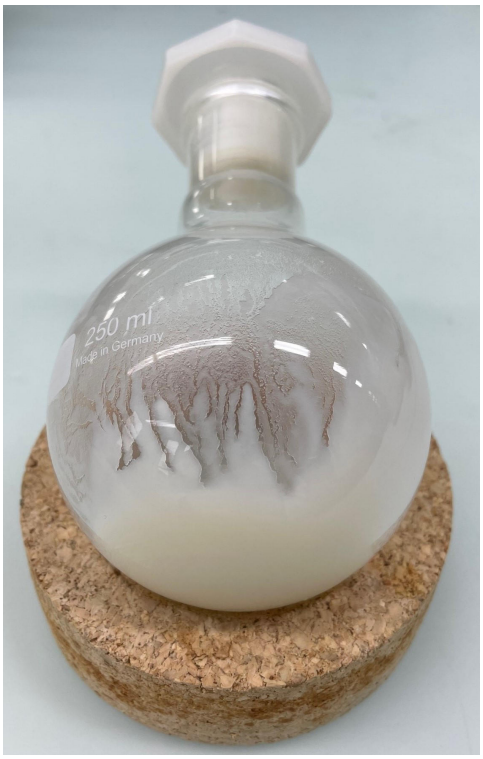

Figure 2. Cold-extracted fat from ground sausages. The petroleum ether was removed at 15 mbar at room temperature.

EXPERIMENTAL

First, an appropriate amount of cold-extracted fat is weighed into the reaction vessel, and then the analysis is started.

The Rancimat method (Figure 3) is based on exposing the sample to an airflow at a constant temperature between 100–180 °C. Highly volatile secondary oxidation products are transferred into the measuring vessel with the airflow where they are absorbed in the measuring solution. The conductivity is continuously registered here.

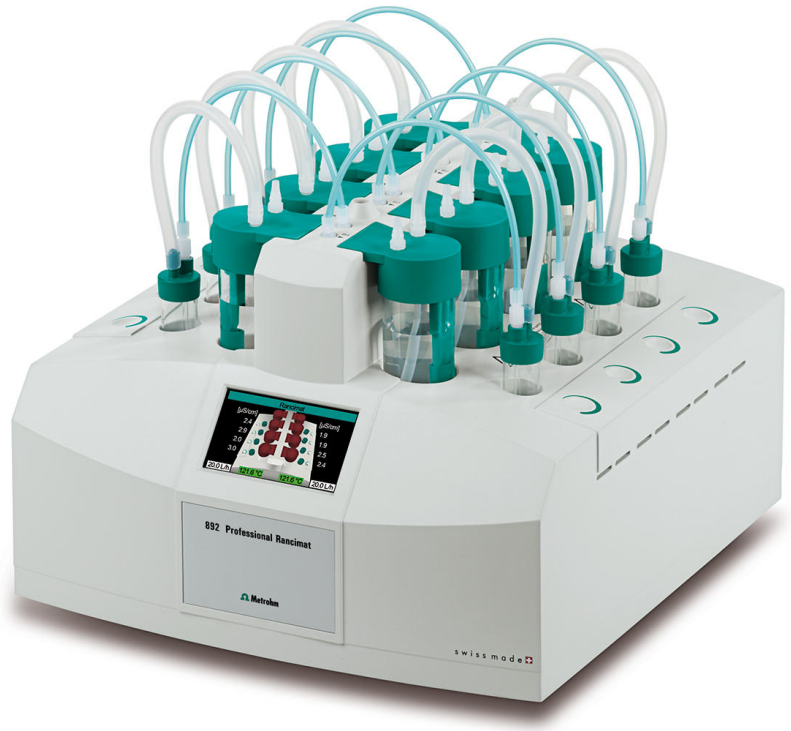

Figure 3. 892 Professional Rancimat equipped with measuring and reaction vessels for the determination of oxidation stability.

The formation of secondary oxidation products leads to an increase in the conductivity of the measuring solution. The time until occurrence of this marked conductivity increase is referred to as the «induction time». The induction time is a suitable indicator for the oxidation stability of the analyzed sample (Figure 4).

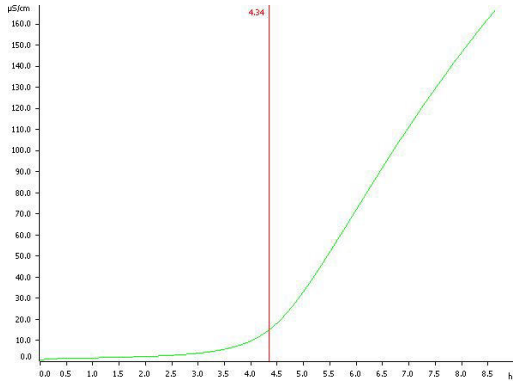

Figure 4. Determination of the oxidation stability of coldextracted fat from a bratwurst sausage. Induction time is determined at 4.34 h.

Table 1. Results of the oxidation stability of cold-extracted fat of sausages with the 892 Professional Rancimat at 120 °C.

Sample (n=4)	Mean value (h)	SD(abs) in h	SD(rel) in %
Cervelat	5.69	0.04	0.6
Bratwurst	4.31	0.02	0.5

CONCLUSION

In order to make specific statements about the fat contained in sausage and other meat products, an extraction step is indispensable. For this purpose, very selective information can be collected and evaluated when measuring oxidation in sausages and similar products.

With the 892 Rancimat, reproducible and accurate determination of the oxidation stability of extracted fat can be easily and simultaneously determined in eight different samples at a time.

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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.