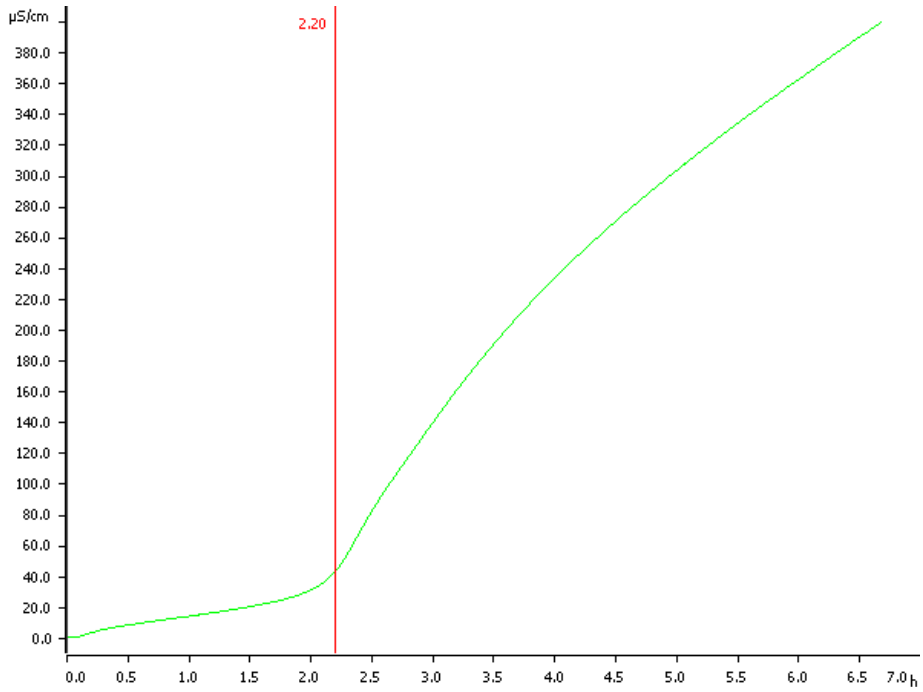
Stability Application Note R-025

Oxidation stability of coffee

Fast determination of oxidation stability without sample preparation



The freshness as well as the smell and taste of coffee depend, among other things, on the content of antioxidants. The antioxidant content is critical to set a retail price and therefore it is of great interest for manufacturers and distributors to determine it. Classically, this parameter is determined via long-term storage tests. Oxidation stability offers a fast, alternative method, which can define the quality of coffee.

Using the modified Rancimat method, the oxidation stability of coffee can be determined quickly and reliably. The sample is analyzed together with polyethylene glycol (PEG). The antioxidants present in the sample matrix stabilize the induction time of the PEG. The induction time can therefore be related directly to the oxidation stability and antioxidant content of the sample.

This Application Note demonstrates the feasibility of the modified Rancimat method. Using the 892 Professional Rancimat, reproducible and accurate determination of the oxidation stability of different coffees is possible.

Metrohm

Method description

Samples

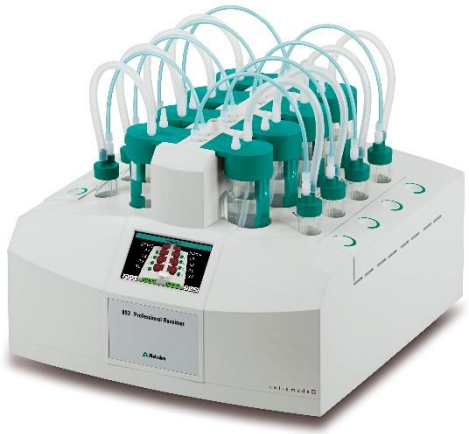
Ground coffee

Instant coffee

Sample preparation

No sample preparation is required.

Configuration



Analysis

An appropriate amount of polyethylene glycol and sample are weighed into the reaction vessel and the analysis is started.

With the Rancimat method, the sample is exposed 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. Here, the conductivity is continuously registered. The secondary oxidation products lead to an increase in the conductivity. 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.

In the PEG method, polyethylene glycol is used as a carrier material. Its induction time is dependent on the weighed amount of antioxidants. The more antioxidants present in a sample, the greater the oxidation stability. With this method, samples which otherwise cannot be determined with the conventional Rancimat method can be analyzed.

Results

Sample (n = 4)	Mean value / h	s(abs) / h	s(rel) / %
Encapsulated ground coffee "Espresso forte"	3.41	0.21	6.1
Encapsulated ground coffee "Espresso leggero"	2.48	0.05	1.9
Encapsulated ground coffee "Lungo forte"	3.28	0.07	2.1
Encapsulated ground coffee "Lungo leggero"	2.21	0.13	6.0
Encapsulated and decaffeinated ground coffee "Lungo decaffeinato"	5.90	0.40	6.8
Instant coffee "Gold"	5.42	0.53	9.8
Instant coffee "Gold" (>6 months stored)	2.84	0.07	2.5
Instant coffee "Noblesse oro" (>5 years stored)	0.78	0.05	7.0
Instant coffee decaffeinated "Gold"	2.59	0.09	3.5
Kopi luwak ground coffee "Arabica Gayo wild"	2.60	0.07	2.7
Kopi luwak ground coffee "Sumatra"	2.48	0.04	1.6

Summary

The results show with an increase in storage time, the quantity of antioxidants and thereby the quality of coffee decreases. Therefore, the induction time can be directly related to the oxidation stability of the sample. The results reveal that a higher quality of coffee or a fresher coffee has a higher antioxidant level and longer induction time. Significantly faster and more reliable results could be realized than with long-term storage tests.

Overall, the demonstrated method delivers acceptable values for all samples with s(rel) ≤ 10%.

Stability Application Note R-025
Version 1, published in October 2019
AW ST CH7-0172-082019