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## Oxidation Stability of Face cream

Reference: International Standard Procedure AOCS Cd 12c-16

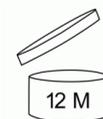
Tested with Velp Scientifica OXITEST Oxidation Stability Reactor (Code F30900248)



## Introduction

The shelf life, or expiration date, of a cosmetic or personal care product is the period during which the manufacturer has determined a product to be best suited for use.

In Europe, cosmetic products with a lifespan longer than 30 months must show a "period after opening" (POA) time. That is, the time in months when the product will remain in good conditions after the consumer has used the product for the first time. A symbol of an open cream jar is usually used instead of words and the time in months can be inside the symbol or alongside it. Although this symbol is frequently present on some U.S. cosmetics products, it is not required.



In Europe, any cosmetic product that has a lifespan of less than 30 months must show a "Best before the end of" date. This can be shown using the "egg timer" symbol followed by the date, or the words, which can be abbreviated to BBE or Exp, followed by the date.

Shelf life of cosmetics is often correlated to their resistance to oxidation. The challenge is to protect against oxidation from the onset of oxidation yielding products with a much longer shelf life.

## Oxidation Stability in Cosmetics

One of the most important factors defining the quality of cosmetics is product alterations caused by the absorption of oxygen resulting in ageing, loss of functional properties and in some cases yellowing.

Hence the lifetime of many cosmetics is closely related to oxidation which is promoted by oxygen, light, high temperatures, trace metals and, in some cases, enzymes.

OXITEST can determine the oxidation stability of various sample types, testing the whole sample, without the need of pretreatments.

## OXITEST Principle

OXITEST speeds up the oxidation process because of the two accelerating factors, temperature and oxygen pressure, according to the most common applications.

The instrument measures the absolute pressure change inside the two chambers, monitoring the oxygen uptake by reactive components in the sample and automatically generates an IP value.

**IP Definition:** IP stands for Induction Period and it is the time required to reach the starting point of oxidation, corresponding to either a level of detectable rancidity or a sudden change in the rate of oxidation. The longer the Induction Period, the higher the stability against oxidation over time.

## Sample

3 face creams containing different levels of tocopherol as antioxidant agents:

- Face cream formula A
- Face cream formula B
- Face cream formula C

The fat content of the face creams is 10.5 %.

The aim of the work is to evaluate the oxidation stability of the 3 samples related to the different tocopherol levels, in order to produce a face cream with a good shelf life.

## Equipment and Chemicals

- Analytical balance, 3 decimals
- Oxygen, purity grade 5.0
- Silicone grease

## Sample Preparation

Spread 10.0 grams of homogeneous face cream directly on the surface of the titanium sample holder, by using a spatula.

In each reaction chamber (A and B), place 3 sample holders (containing the sample, for a total of 30 g ).

## Analysis Procedure

Grease the O-rings with silicon grease and set them in their position. Close the chambers with the titanium covers and turn the discharge valves in open position. Set the following conditions on the OXISoft™ software:

**Temperatures:** 100 °C

**Oxygen Pressure:** 6 bars

When the temperature set is reached inside the chambers, close the discharge valves and start loading oxygen.

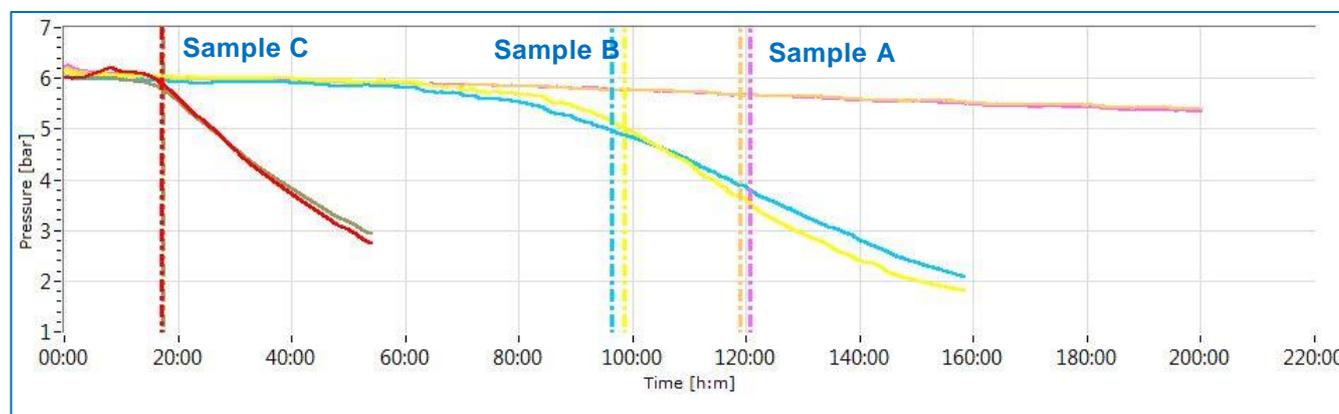
Data acquisition is automatically started by the software.

## Typical Results on Face creams

Each sample has been monitored two times. At the end of the oxidation tests, the IP of every run is calculated by the software OXISoft™.

It is possible to elaborate the oxidation curves obtained for each formula of face cream.

Sample	Weight (g)	Set Point (bars)	Set Point (°C)	IP (hh:mm)	Line
Face cream A	30.0	6.00	100.0	118:55	
Face cream A	30.0	6.00	100.0	120:35	
Face cream B	30.0	6.00	100.0	98:32	
Face cream B	30.0	6.00	100.0	96:21	
Face cream C	30.0	6.00	100.0	17:06	
Face cream C	30.0	6.00	100.0	17:29	



## Repeatability Test

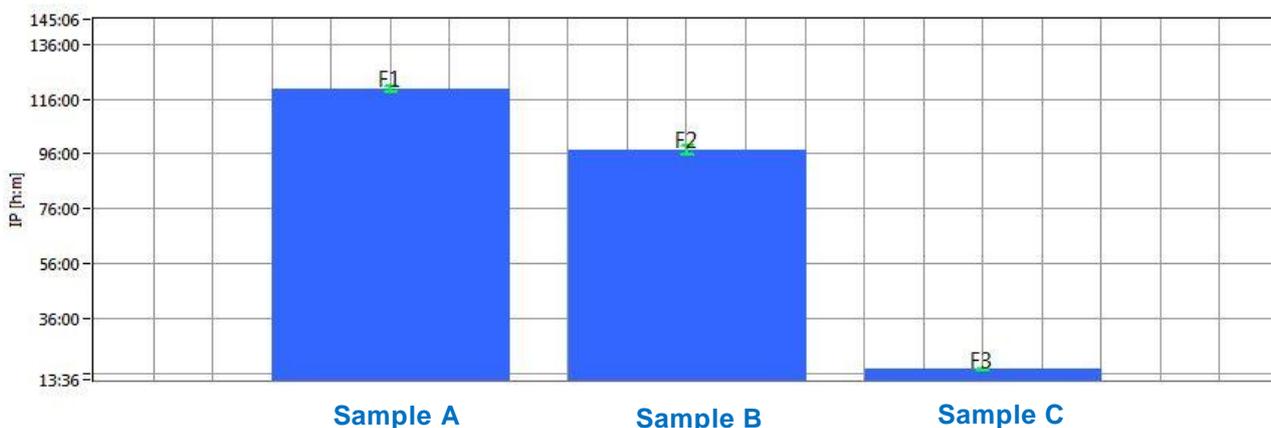
With OXISoft™, it is possible to create a repeatability test for each analysis, in order to obtain the average, standard deviation and relative standard deviation of the results.

For repeatability test, it is necessary to analyze the same quantity of the sample in duplicate, at the same values of temperature and pressure. In the table below the results are summarized:

Sample	IP average (hh:mm)	SD (hh:mm)	RSD %
Face cream A	119:45	1:10	1.0
Face cream B	97:26	1:32	1.6
Face cream C	17:17	0:16	1.6

## Formulas Comparison

With OXISoft™, it is also possible to easily compare the obtained IP values, of different formulations tested at the same conditions, and identify the most stable one.



## Conclusions

From the results obtained by OXISoft™ and the formulas comparison function, it's clear to discriminate the face creams resistance to oxidation: face cream C shows the shortest IP, followed by sample B and A. Thus the face cream with the optimal content of tocopherol as antioxidant agents is the face cream formula A, that shows the highest oxidation stability.

Benefits of OXITEST are:

- Test is made directly on the whole sample
- No need for preliminary fat separation of the sample
- Resistant titanium chamber
- Time saving analysis, if compared to the traditional methods
- Especially designed for R&D, Product Development and Quality Control labs
- Many investigations available through the software OXISoft™:
  1. Repeatability test: a series of tests run on the same sample or standard to verify its IP period, to calculate accuracy and repeatability of the data
  2. Freshness test: to verify the quality of different lots, for example of the same raw material, and compare them
  3. Formula comparison: to identify the most stable formula of a finished product, under the same conditions
  4. Packaging comparison: for testing which packaging maintains the product in the freshest condition
  5. IP during ageing: to obtain a graph of the decrease of the product IP during the shelf-life period
  6. Estimated shelf life: to have a prediction of oxidation stability during the shelf life.