Impact of centrifugation on stability study

Application

Accelerating stability determination thanks to mechanical stress

Objective

Determine if applying a mechanical stress (centrifugation) enables the determination of a “real” shelf-life for various products.

Method

Centrifugation + Optical detection (transmission)

Introduction

Determining the shelf-life of formulated products is a key step during the development of a new or improved formulation. One of the greatest challenges is to decrease the “time-to-market”, in order to reduce costs of development and be more reactive compared to competitors.

The “classical” method to determine shelf-life and stability of a given product is to perform visual tests via an operator, checking the “quality” of a product *via* bottle tests. This method is tedious and time-consuming, and also depends on the operator who checks the quality of the product.

Fig. 1 - Bottle-test analysis of petroleum and cosmetic samples

Most of the other techniques dedicated to stability study combine visual observation or detection with a stress method.
There are two ways of stressing a sample:

- Thermodynamical stress (such as temperature) ;
- Mechanical stress (such as centrifugation) ;

The thermodynamical stress is the most common and well accepted method to accelerate destabilisation.

The purpose of this paper is to describe the effect of centrifugation on the shelf-life prediction.

Measurement Protocol

A panel of various products (see details below) were sampled into graduated glass cells and left at room temperature (controlled at 22°C). An operator checked the state of dispersion on a regular basis, until a layer of 1 mm was detected with the naked eye.
The same products were analysed by using centrifugation. The predicted shelf-life is determined by extrapolating the data obtained at various centrifugation forces to g = 1 (no centrifugation).

The products were chosen from various application fields (cosmetics, food, raw materials, paint & inks, home care, etc…). Some of them were Newtonian (purely viscous), others were viscoelastic.