

Surface active agents — Determination of foamability and degree of foamability — Circulation test method

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee CII/34, Methods of test for surface active agents, which has the responsibility to:

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- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
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Foreword

This document (EN 14371:2004) has been prepared by Technical Committee CEN/TC 276 “Surface active agents”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2005, and conflicting national standards shall be withdrawn at the latest by March 2005.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

The foamability and foamability degree are specified by means of a circulation equipment, whereby the solution of the surface active agent is under fast circulation for 10 min. During this circulation a definite volume of foam is generated which is a typical characteristic for the surface active agent at a certain concentration and temperature. This volume is called "foamability" and is recorded on a 0 ml to 1 500 ml scale and expressed in millilitres.

Additionally the degree of foamability is recorded in parallel on a 0 % to 300 % scale or calculated from the foamability.

A basic objective is to test within a time, a defined circulation speed and a concentration range in which the foam formation comes to a saturation volume. This saturation foam volume nearly represents maximum foamability and is characteristic for any surface active agent.

After the circulation has been stopped, the destabilisation of the foam and the time in which half volume of foam is collapsed are recorded. The half volume collapsing time $t_{V/2}$ indicates the foam stability of the surface active agent.

A foamability profile versus temperature can be achieved by using single isothermal measurements (Method M 1) or by using a new continuous method (Method M 2), where the temperature is changed (increased) during the test. It was been found that the saturated volume quickly follows the temperature changes during circulation.

1 Scope

This document specifies a method for the determination of foamability and degree of foamability of surface active agents by means of a circulation equipment, whereby the solution of the surface active agent is under fast circulation.

The method is applicable to many surface active agents, especially for low and medium foaming surface active agents and products containing surface active agents.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 3696, *Water for analytical laboratory use — Specification and test methods (ISO 3696:1987)*

EN ISO 4788, *Laboratory glassware – Graduated measuring cylinders (ISO/DIS 4788:2003)*

3 Principle

A gear pump recycles 500 g of the test solution, which is carefully controlled concerning the temperature, in a 2 000 ml jacked cylinder and sprays it in a bypass system through a nozzle onto the surface of the liquid. During the test under high flow rate (200 l/h) a characteristic constant "saturated" volume is formed which cannot significantly be increased by any increase of the circulation rate.

The volumes are measured either by visual recording or other equivalent recording auxiliaries like electronic foam height recording systems.

The additionally created foam, starting from a 500 g (ml) volume, is recorded each 30 s. In the time interval between 5,5 min and 10 min where a stable foam phase is observed, the average volume is determined. The foamability at the concentration c and the temperature T , $F_{(c, T)}$, results from it as follows:

$$F_{(c, T)} = \Sigma V_{s(5,5 \text{ min} \dots 10 \text{ min})} / 10 = 0 \text{ ml} \dots 1\,500 \text{ ml}$$

where

$\Sigma V_{s(5,5 \text{ min} \dots 10 \text{ min})}$ is the sum of the recorded, saturated volumes at 5,5 min; 6 min; 6,5 min; 7 min; 10 min.

Finally the generated volume (= foam) can be compared with the starting volume and is expressed or recorded at a scale as degree of foamability at the concentration c and the temperature T , $F_{D(c, T)}$:

$$F_{D(c, T)} := F_{(c, T)} / 5 = 0 \% \dots 300 \%$$

Finally, having stopped the circulation the collapsing phase is recorded as the half volume of foam collapsing time $t_{v/2}$ expressed in seconds.

This indicates the stability of the foam and is an optional parameter, which can be measured. This value can be determined by extrapolating from a graph or the collected data values or measured directly.

First such a concentration is chosen, that at 25 °C a volume of foam of about 700 ml to 1 200 ml can be reached under above conditions, so that good foam characteristics with good resolutions of the values can be achieved.