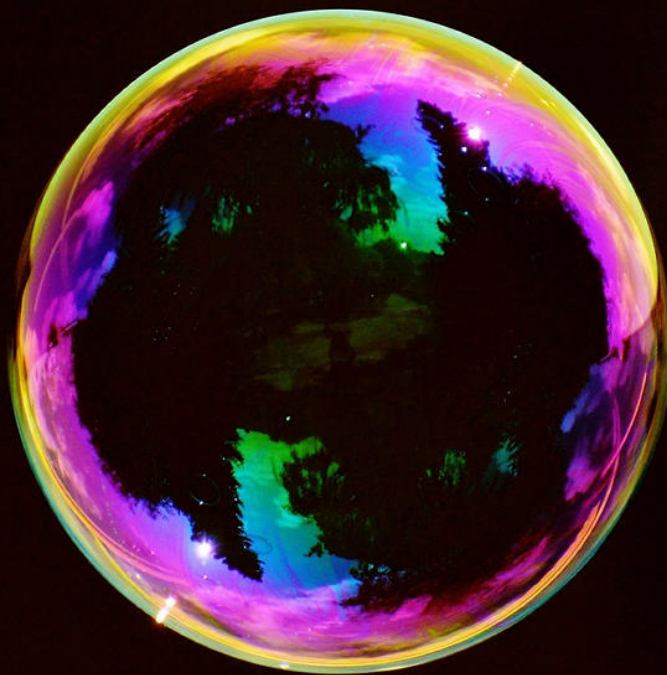




Application Note AN-T-245

# 通过两相滴定法对离子表面活性剂进行光度测定

## Accurate and reliable results with the Optrode according to the classical Epton titration

The two-phase Epton titration method is the standard approach for titrating ionic surfactants. It is used whenever the delivery conditions specify this method or when potentiometric surfactant titration cannot be carried out, such as with powdered washing agents.

This Application Note presents the two-phase

titration of ionic surfactants according to Epton. The titration is optimized for the OMNIS Software. Specifically, the concentration of sodium dodecyl sulfate (SDS) in shower gel is determined by titration with hyamine using an Optrode M2.

## INTRODUCTION

Two-phase titrations were first developed in the early 1930s and still continue to be improved upon. In 1947, chemist S. R. Epton developed the Epton titration method. In this first iteration, an anionic sample is mixed with methylene blue in diluted sulfuric acid (as an indicator), and chloroform. Vigorous shaking forms an ionic salt that is extracted into the chloroform, turning the phase a blue color. Titrating with the classical cationic surfactant cetylpyridine bromide causes the color to slowly migrate into the upper aqueous phase. The endpoint is reached when both phases turn blue.

In the 1960s, Holness and Stone developed the

method into its current form. They replaced methylene blue with a mixed indicator, dimidium bromide-disulfine blue, and used Hyamine® 1622 as cationic titrant. This new indicator clearly improved endpoint recognition because the color change is only observed in the chloroform phase. The chloroform phase is red in the presence of excess anionic surfactant ions and blue in the presence of excess cationic surfactant ions.

Depending on the titrant (e.g., hyamine or SDS), either anionic or cationic surfactants can be titrated. Despite this, the term «Epton titration» has stuck and is still used today.

## SAMPLE AND SAMPLE PREPARATION

This application is demonstrated on shower gel.

Sample preparation is not required.

## EXPERIMENTAL

The determination is carried out on an OMNIS Professional Titrator equipped with OMNIS Dosing Modules (**Figure 1**) as well as an Optrode M2.

An appropriate amount of sample is weighed into the titration beaker, then deionized water, mixed indicator (dimidium bromide-disulfine blue), and chloroform are added. The solution is titrated with standardized hyamine until after the first equivalence point is achieved using a wavelength of 520 nm.



**Figure 1.** The OMNIS Professional Titrator with OMNIS Dosing Modules (shown here) are ideal for two-phase titrations of ionic surfactants when equipped with the Optrode M2.

## RESULTS

The Epton titration method offers very accurate results, as displayed in **Table 1**. An exemplary titration curve of SDS in shower gel with hyamine is given in **Figure 2**, showing the sharp jump in voltage at the equivalence point.

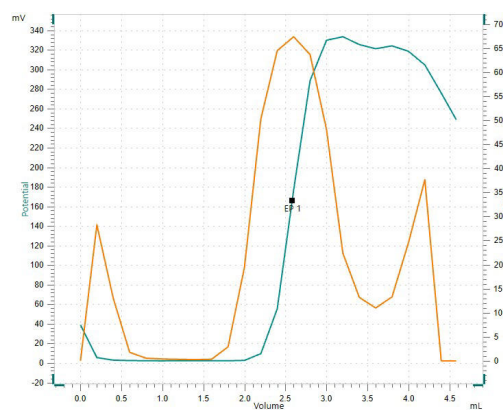


**Figure 2.** Epton titration curve at 520 nm with one equivalence point.

**Table 1.** Results of the Epton titration of SDS in shower gel (n = 6).

| Sample (n = 6) | SDS (%) | SDS (mmol/100g) |
|----------------|---------|-----------------|
| Mean value     | 5.09    | 17.65           |
| SD(abs)        | 0.05    | 0.19            |
| SD(rel) in %   | 1.1     | 1.1             |

## CONCLUSION

Precise and reliable determination of ionic surfactants according to the Epton two-phase titration can be achieved using an OMNIS

system. The Optrode M2, with its glass shaft, is fully resistant against solvents and is therefore ideal for surfactant titrations with chloroform.

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## CONFIGURATION



### OMNIS Professional Titrator

创新型、模块式电位分析 OMNIS Titrator,适于独立运行或作为 OMNIS 滴定系统的核心元件运行,用于终点和等当点滴定(单一/动态)。由于采用 3S OMNIS Liquid Adapter 技术,处理化学品从未像现在一样安全。可以使用测量模块和计量管单元自由配置滴定仪,并在需要时扩展一台棒式搅拌器。包括用于使用其他滴定或加液模块平行滴定的“Professional”功能许可证。

- 通过计算机或本地网络控制
- 可以为其他应用或辅助溶液另外连接最多四个滴定模块或加液模块
- 棒式搅拌器的连接方式
- 可提供不同大小的计量管:5、10、20 或 50 mL
- 采用 3S 技术的 OMNIS Liquid Adapter:安全处理化学品,自动传输生产厂家的原始试剂数据

#### 测量模式和软件选项:

- 终点设定滴定:“Basic” 功能许可证
- 终点和等当点滴定(单一/动态):“Advanced” 功能许可证
- 终点和等当点滴定(单一/动态),包括 5 路平行滴定:“Professional” 功能许可证



### OMNIS Dosing Module

用于与 OMNIS Titrator 滴定仪相连的加液模块,以扩展额外用于滴定/加液的滴定管。可以扩展磁力搅拌器和/或螺旋搅拌器,以作为单独的滴定台使用。可自由选择 5、10、20 或 50 mL 计量管单元。



### Optrode M2

有 8 种可用波长的光度滴定法用光学传感器。可以通过软件控制(tiamo 2.5 及以上版本)或通过磁铁来进行波长切换。该玻璃鞘对溶剂完全耐受,并且易于清洁。这种节省空间的传感器适用于例如:

- 按照 USP 或 EP 的非水溶性滴定
- 羧基端基的测定
- TAN/TBN 根据 ASTM D974
- 硫酸测定
- 混凝土中的 Fe、Al、Ca
- 水硬度
- 根据 USP 的硫酸软骨素

传感器不适合通过测量颜色强度(比色法)来测定浓度。



### 50 – 150 mL

用于 6014050X0 滴定杯上部的带有螺旋塞的 50 – 150 mL 滴定杯。