Application Note AN-T-246

子表面活性的滴定准法

Accurate assay determination of TEGO®trant with silver nitrate including near-infrared (NIR) quantification model

A well-known frequently used cationic surfactant (TEGOtrant, also known as 1,3-didecyl-2-methylimidazolium chloride) is standardized in this Application Note. The stoichiometric chloride is titrated argentometrically with standardized silver nitrate, enabling an extremely precise determination of the assay. Therefore, the result determined is equivalent to the total surfactant content, allowing the accurate calculation of the cationic surfactant concentration.

Furthermore, a quantification model was developed that uses NIR measurements in addition to titration. This enables users to quickly determine cationic surfactant content using only NIR spectroscopy.

There are no primary or secondary standard methods for titrating or determining the active substance content of anionic and cationic surfactants. A cationic titrant is standardized using an anionic titrant, and vice versa. In short, the result of this titration is a sum parameter usually specified as «total surfactant content». This value is then used to determine the content in the actual sample.
The major weakness of this type of standardization is the significant margin of error one must accept. Because the exact concentration of the titrant is unknown, conclusions about the analyzed sample can only be made with limited accuracy.

SAMPLE AND SAMPLE PREPARATION

This application is demonstrated on 25 different batches of TEGOtrant A100 (1,3-didecyl-2-methylimidazolium chloride). The sample is ground into a fine powder before analysis.

EXPERIMENTAL

The determination is carried out using an OMNIS Sample Robot S – WSM, an OMNIS Professional Titrator equipped with OMNIS Dosing Modules, as well as a dAg Titrode along with an OMNIS NIR Analyzer Solid (**Figure 1**).

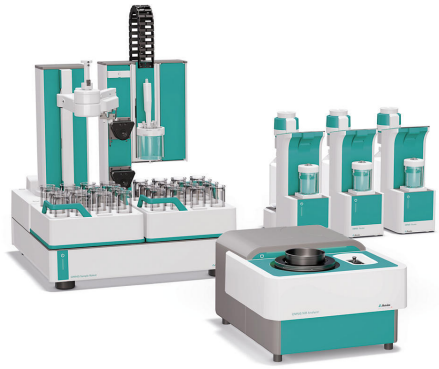

Figure 1. OMNIS Sample Robot S – WSM with OMNIS Professional Titrator and OMNIS Dosing Modules equipped with a dAg Titrode as well as an OMNIS NIR Analyzer Solid.

Titration

An appropriate amount of sample is weighed into the titration beaker, to which deionized water and a nitric acid solution are added. A titration is performed until after the first equivalence point with standardized silver nitrate.

NIR spectroscopy

A sufficient amount of sample is added to the small cup NIR accessory. This is placed in the corresponding holder which is already mounted on the OMNIS NIR Analyzer Solid.
Five determinations were carried out automatically in triplicate for each near-infrared measurement.

RESULTS

This method offers very accurate results, as displayed in **Table 1**. The comparative measurement of the control sample, summarized in **Table 2**, shows that the values from the titration and the NIR measurement differ by only 0.5%. Exemplary titration and NIR measurements of TEGOtrant are given in **Figure 2** and **Figure 3**, respectively.

Table 1. Selected results of the potentiometric determination of TEGOtrant.

Sample (n = 3), batch number	Assay mean value in %	SD(rel) in %
20780065	96.16	0.3
11020053	94.11	0.1
11070002	95.65	0.3
00470397	95.19	0.1
00530513	93.71	0.3

Table 2. Summary of results for assay determination of the TEGOtrant «control sample» by titration and NIR.

Control sample, batch number	Assay mean value in %	SD(rel) in %
20650022 by titration (n = 6)	97.61	0.2
20650022 by NIR (n = 15)	98.13	0.3
Difference	0.52%	–

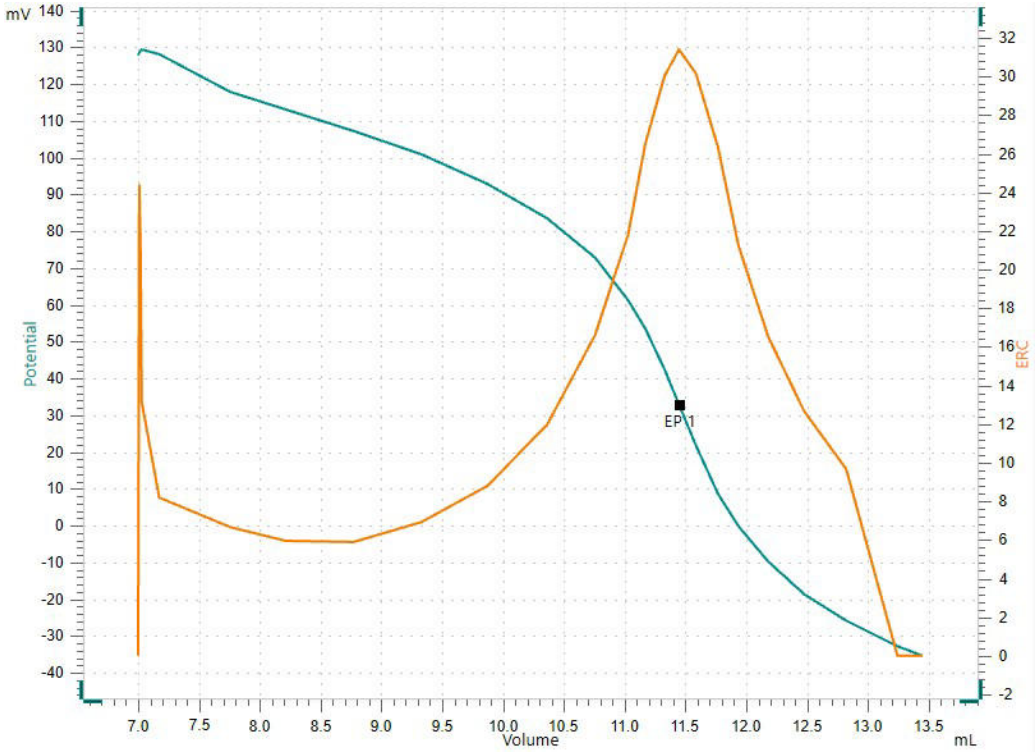

Figure 2. Titration curve of TEGOtrant with silver nitrate and the dAg Titrode.

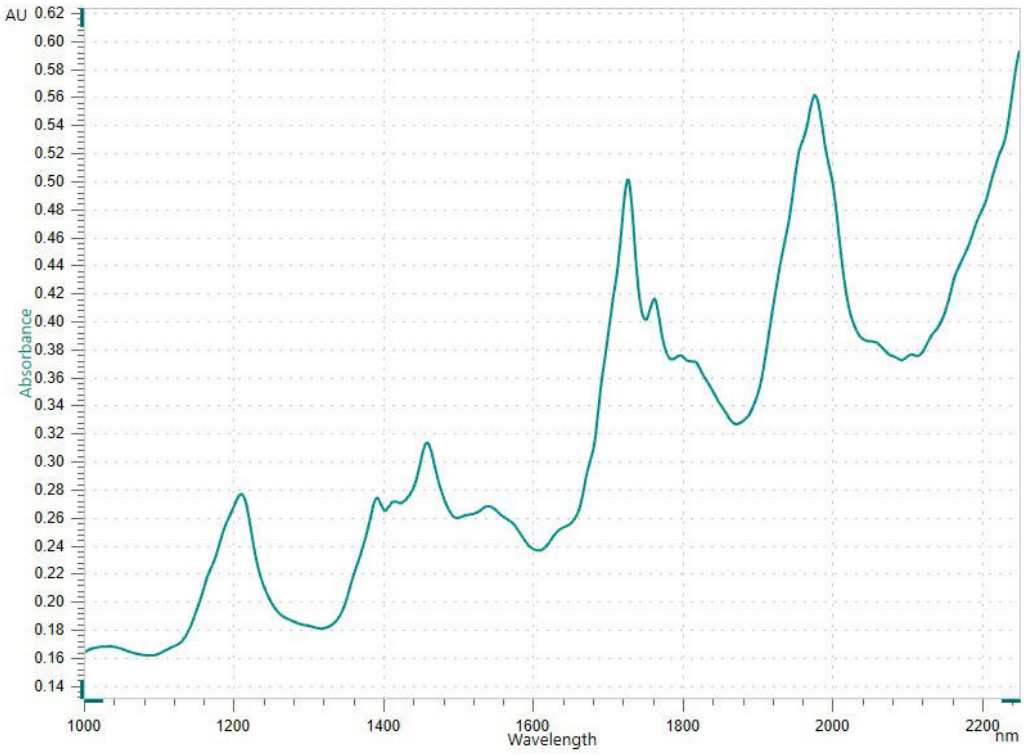

Figure 3. NIR spectrum of TEGOtrant between the wavelengths of 1000 nm and 2250 nm.

Potentiometric titration is an accurate and precise method that can be used to standardize the cationic surfactant TEGOtrant.

The OMNIS system used in this study is fully automated and enables fast and reliable cationic surfactant titration standardization. The argentometric determination with the digital Ag Titrode is highly accurate. Furthermore, the Ag_2S-coated silver ring increases sensitivity, delivering even better results.

When used with the corresponding OMNIS NIR Analyzer Solid, OMNIS Software can easily create a quantification model on a single platform, offering users real added value for the TEGOtrant standardization.

CONTACT

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CONFIGURATION

OMNIS Professional Titrator

OMNIS Titrator,(/) 3S OMNIS Liquid Adapter ,丌, “Professional”

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- /
- :51020 50 mL
- 3S OMNIS Liquid Adapter:,

:

- :“Basic”
- (/):“Advanced”
- (/), 5 :“Professional”

OMNIS Dosing Module

OMNIS Titrator ,//, 51020 50 mL 丌

OMNIS Dosing Module

OMNIS Titrator ,//, 51020 50 mL

OMNIS Dosing Module

OMNIS Titrator ,//, 51020 50 mL

OMNIS Sample Robot S – WSM (1T/2P)

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OMNIS NIR Analyzer Solid

OMNIS NIR Analyzer (NIRS) , OMNIS Software NIR

OMNIS NIR Analyzer Solid :

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