



## Application Note AN-T-214

# Kjeldahl nitrogen in waste water

## Easy determination by titration according to ASTM D3590

Nitrogen-based compounds are widely distributed in the environment. They are essential growth nutrients for photosynthetic organisms (e.g., plants and algae). Therefore, it is important to monitor and control the amount of nitrogen compounds which are released into the environment.

In this Application Note, a method to determine the nitrogen content in water by Kjeldahl digestion and distillation followed by a photometric or potentiometric titration according to **ASTM D3590** is presented. Nitrogen determination by Kjeldahl digestion and

distillation has been performed since 1883. The universality, precision, and reproducibility of the Kjeldahl method have made it the internationally recognized method for e.g. estimating the protein content in many matrices and it is the standard method to which all other methods are judged against.

After the Kjeldahl distillation, the nitrogen content is determined by acid-base titration. This can either be a photometric or potentiometric titration depending on the sample and the preferences of the user. Both titration methods offer a reliable and inexpensive determination.

## SAMPLE AND SAMPLE PREPARATION

This application is demonstrated on wastewater for the photometric titration, and on spiked water for the potentiometric titration.

Each sample is transferred into the Kjeldahl tube for digestion. The digestion is performed automatically using a commercially available

digester. After the digestion, a sodium hydroxide solution is added to the mixture and the resulting ammonia is automatically distilled into a collecting vessel containing boric acid using a steam distillation apparatus.

## EXPERIMENTAL

This analysis is carried out on an OMNIS Advanced Titrator equipped with an Optrode for the photometric titration, and with a dEcotrode plus for the potentiometric titration. The prepared samples are titrated with sulfuric acid until after the equivalence point is reached. To ensure good recovery and reproducibility, it is important that the distillation apparatus used for this sample preparation is leak-proof and that the water, which is used for the blank, is nitrogen-free.



**Figure 1.** OMNIS Advanced Titrator equipped with a dEcotrode plus for the potentiometric determination of Kjeldahl nitrogen in water.

## RESULTS

The recovery and standard deviation of the two different titrations could not be compared, as different samples were used. However, for both

methods relative standard deviations are below 2%, which is acceptable for this application.

**Table 1.** Results of the nitrogen determinations in water by titration after the Kjeldahl digestion and distillation.

	Photometric titration (n = 4)	Potentiometric titration (n = 3)
Mean	33.63 mg/L	19.78 mg/L
SD(abs)	0.45 mg/L	0.26 mg/L
SD(rel)	1.33%	1.34%

## CONCLUSION

Titration is an easy method to determine Kjeldahl nitrogen in wastewater according to **ASTM D3590**. The titration can be either performed photometrically or potentiometrically. The potentiometric method provides the advantage that no indicator is needed. On the other hand, the Optrode for photometric measurements is maintenance-free.

Internal reference: AW TI CH1-1301-032020

Which titration is used depends on the sample and the preferences of the user.

For both methods, an OMNIS Titrator can be used. This allows you to customize the system according to your needs and expand it for other titration applications required for the quality control of water.

## CONTACT

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## CONFIGURATION



### OMNIS Advanced Titrator

新型、模式位分析 OMNIS Titrator 滴定,于独立行或作 OMNIS 滴定系的核心元件行,用于使用 OMNIS Sample Robot 行点和等当点滴定(一/)。由于采用 3S 瓶配器技,理化学品从未像在一安全。可以使用量模和量管元自由配置滴定,并在需要展一台螺旋拌器。在需要可以通相的件功能可平行滴定升 OMNIS Advanced Titrator。

- 通算机或本地网控制
- 可以其他用或助溶液外接最多四个滴定模或加液模
- 螺旋拌器的接方式
- 可提供不同大小的量管:5、10、20 或 50 mL
- 采用 3S 技的瓶配器:安全理化学品,自生商的原数据

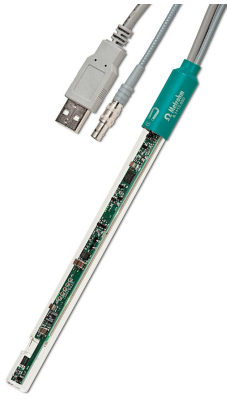
### 量模式和件:

- 点定滴定:“Basic” 功能可
- 点和等当点滴定(一/):“Advanced” 功能可
- 点和等当点滴定(一/),包括平行滴定:“Professional” 功能可

### Ecotrode plus

用于含水的酸/滴定的合 pH 。固定磨口隔膜染不敏感。参比解:c(KCl) = 3 mol/L,存在存溶液中。





## Optrode

有 8 可用波的光度滴定用光学传感器。可以通件控制 (tiamo 2.5 及以上版本)或通磁来行波切。玻璃鞘溶完全耐受,并且易于清。省空的传感器用于,例如:

- 按照 USP 或 EP 的非水溶性滴定
- 基端基的定
- TAN/TBN 根据 ASTM D974
- 硫酸定
- 混凝土中的 Fe、Al、Ca
- 水硬度
- 根据 USP 的硫酸骨素

传感器不合通量色度(比色法)来定度。