



Application Note AN-T-225

Analysis of caffeine, pH, and acidity in coffee

Fully automated determination including filtering, reagent addition, and sample pipetting using OMNIS

With the ever-increasing consumption of coffee due to the availability of small home espresso machines, shelf life and consistency of flavor are becoming more important for brand quality in a competitive market.

Many of the key factors that influence coffee taste correlate with chemical properties that can be measured. These include pH, titratable acidity, refractive index, and caffeine.

Historically, many of these analyses have included long, manual sample preparation processes using the time-consuming, liquid chromatography (LC) technique.

This Application Note looks at a faster, simpler, alternative method for analysis of key quality parameters in coffee using a single titration platform: OMNIS.

PH AND TITRATABLE ACIDITY

Coffee is primarily acidic, with most roast extracts displaying a pH of approximately five. When coffee is too acidic, it can taste sour and be harsh on the palette. When shifting to the alkaline end of the pH scale, the flavor then becomes bland and lifeless.

Different coffee beans require different amounts of roasting, depending on the bean origin and the level of acidity, to achieve the consistent flavor expected from the brand line. By

analyzing the pH and acidity of coffee brewed under consistent conditions, it is possible to judge the final flavor of a roast. This is most beneficial to roasters of large volumes of coffee beans, or to those who supply products with expected flavor profiles (e.g. instant coffee pods).

The analysis of pH and acidity in brewed coffee is quite simple and very similar to the procedure used for juices and soft drinks.

Table 1. Results of quality parameters in various coffee brews measured with OMNIS.

Analyte	Sample 1	Sample 2
pH	5.37	6.41
Acidity (mg/15 g) *	9.9	7.1
Caffeine (mg/15 g) *	120	87

CAFFEINE

Unlike the simple sample preparation required for titratable acidity analysis, the analysis of caffeine in brewed coffee is a more intensive process that relies upon several manual preparation steps. Requiring reagent addition (iodine and sulfuric acid), filtration, and accurate sample volume transfer in specifically timed

steps to provide consistent results, the conventional analysis is very time consuming when performed manually.

The flexibility of OMNIS allows for the automation of these steps, eliminating the variability introduced by manual liquid handling and manual timing.



Figure 1. OMNIS Robot S with Discover and parallel analysis.

OMNIS automates the entire analysis process with:

- Discover Capping system which keeps samples covered until the time of analysis
- Highly accurate dosing of iodine and acid
- Consistent stirring time for reaction
- Automatic inline filtration
- Highly accurate dosing of sample to titration vessel
- Automatic start of titration
- Automatic cleaning of titration vessel and sample path

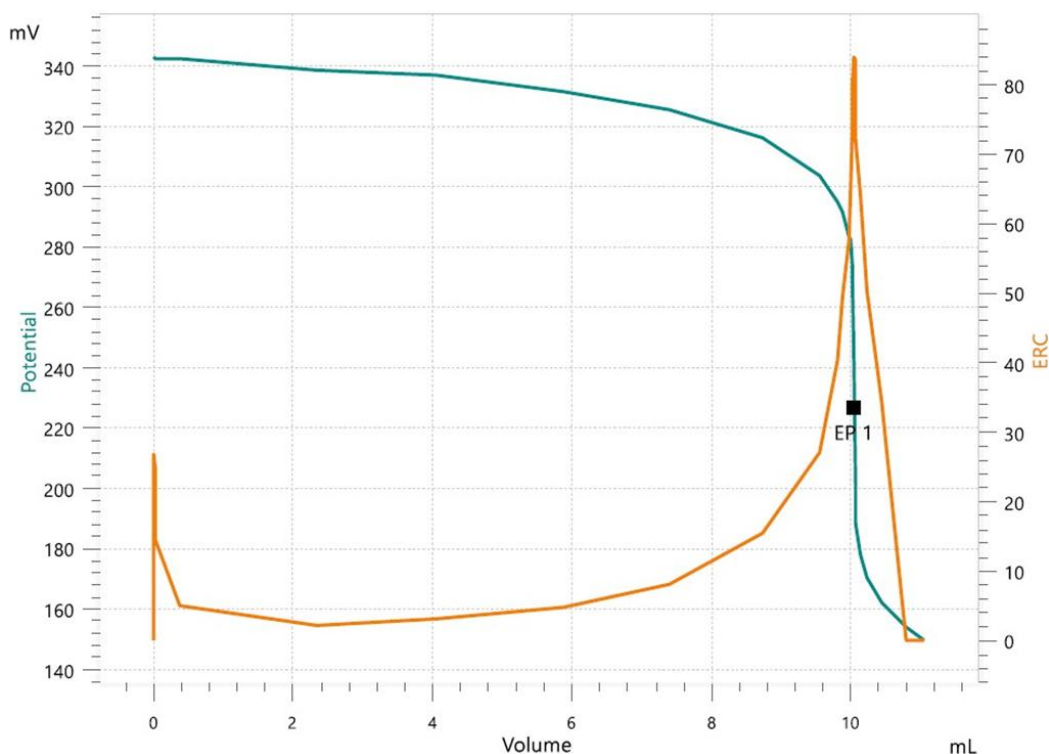


Figure 2. Figure 2. Example titration curve for caffeine analysis with OMNIS.

CONCLUSION

Metrohm's OMNIS titration platform provides the perfect blend of automation and intelligence for the analysis of coffee. Instead of time-consuming manual sample preparation and long analysis times with several different instruments,

key coffee quality parameters can be measured accurately and reliably on a single system. With OMNIS, you can enjoy your coffee without worrying about your analysis.

Internal reference: AW TI AU-001-072020

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CONFIGURATION



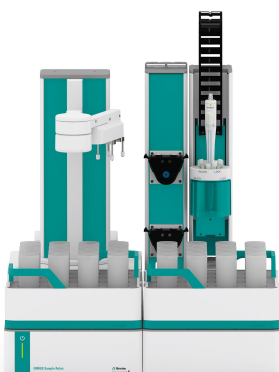
OMNIS Professional Titrator

新型、模式位分析 OMNIS Titrator 滴定,用于行点和等当点滴定(一/)。由于采用 3S 瓶配器技,理化学用品从末像在一安全。可以使用量模和量管元自由配置滴定,并在需要展一台拌器。包括用于使用其他滴定或加液模平行滴定的“Professional”功能可。

- 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
- 可以展磁力拌器和/或螺旋拌器
- 可提供不同大小的量管:5、10、20 或 50 mL
- 采用 3S 技的瓶配器:安全理化学用品,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



OMNIS Sample Robot S Pick and Place

OMNIS Sample Robot S 具有一个“蠕”模(2 通道)和一个 Pick&Place 模以及大量附件,可直接入全自滴定。此系具有个品位置,可用于 32 个 120 mL 的品。此模化系供已完全安装完,因此可在短内投入行。

系也可根据需展配外台蠕以及多加一个 Pick&Place 模,由此使通量翻倍。如果需要更多工作台,可将此 Sample Robot 展 L 格款型的 OMNIS Sample Robot,由此可使七个品的品在多四个 Pick&Place 模上并行理,将品通量大四倍。



dUnitrode Pt1000

数字式、合 pH ,用于集成有 Pt1000 温度传感器的 OMNIS。其特用于:

- 在重、粘稠或性品中行 pH-量和滴定
- 温度提升
- 量

固定套管式隔膜染不敏感。

参比解: $c(\text{KCl}) = 3 \text{ mol/L}$,存在保存液中。

替代方法: $T > 80^\circ\text{C}$ 的量用参比解:Idrolyt,存在 Idrolyt 中。

dTodes 可在 OMNIS Titratoren 上使用。



dPt Titrode

pH 玻璃膜的 OMNIS 用数字合式形,用作参比。

免用于 pH 恒定的化原滴定,例如:

- 量法
- 重酸法
- 量法
- 高酸滴定法

存放在蒸水中。

dTodes 可在 OMNIS Titratoren 上使用。