



Application Note AN-T-231

通过直接滴定法测定咖啡因

Fast and accurate potentiometric determination of caffeine in nonaqueous samples

Caffeine is a natural substance found in many foods including coffee, black and green tea, cola, mate, guarana, energy drinks and, to a lesser extent, cocoa and chocolate.

Chemically speaking, caffeine is considered a weak base. It can be titrated accurately in nonaqueous media if a very strong acid is used as the titrant. The strongest acid in nonaqueous media is perchloric acid (HClO_4) in glacial acetic acid.

Direct titration is particularly suitable for determining the purity of caffeine. Even highly concentrated caffeine samples (e.g., pharmaceuticals) or water-insoluble samples (e.g., cosmetics and oils) can be titrated well in this way.

In this Application Note, caffeine content in nonaqueous samples is accurately and reliably determined by direct titration using the OMNIS Titrator equipped with a dSolvotrode.

SAMPLES AND SAMPLE PREPARATION

This application is demonstrated on caffeine standard, guarana extract concentrate, and

jojoba cosmetic oil. Sample preparation is not required.

EXPERIMENTAL

An appropriate amount of sample is weighed into the titration beaker. Glacial acetic acid, acetic anhydride, and toluene are then added. While stirring, the solution is titrated until after the first equivalence point with standardized perchloric acid in acetic acid (**Figure 1**). The determination is carried out with an OMNIS Titrator equipped with a dSolvotrode (**Figure 2**).

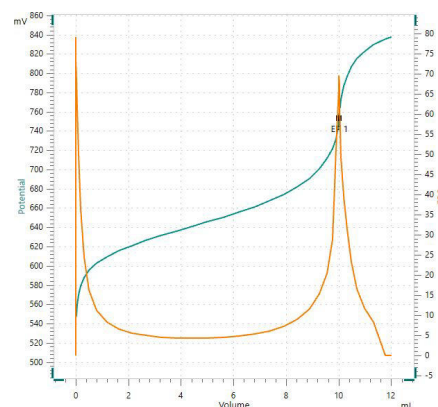


Figure 1.



Figure 2. OMNIS Titrator equipped with a dSolvotrode electrode for the determination of caffeine content in nonaqueous samples.

RESULTS

This method offers very accurate results, as displayed in **Table 1**.

Table 1. Results of caffeine determination in different nonaqueous samples.

Sample (n = 6)	Caffeine in %	SD(rel) in %
Caffeine standard	100.5	0.7
Guarana extract concentrate	54.1	2.9
Jojoba cosmetic oil	0.4	4.7

CONCLUSION

Direct titration is a simple and precise way to accurately measure the caffeine content in different nonaqueous products. The OMNIS Titrator equipped with a dSolvotrode reliably determines caffeine through flexible analyses

combined with high-end software. The dSolvotrode is optimized for nonaqueous titrations and due to its flexible ground-joint diaphragm, it is especially suitable for contaminated samples.

Internal reference: AW TI CH-1330-112022

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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