



Application Note AN-T-232

通过碘反滴定法测定咖啡因

Fast and accurate measurement of caffeine content in aqueous samples

Caffeine belongs to a group of alkaloids that stimulates the central nervous system, affecting breathing and the cardiovascular system. Due to its popular performance-enhancing effects, caffeine is considered the world's most consumed pharmacologically active substance. Iodometric back titration is a simple and accurate method for the determination of caffeine in aqueous solutions or water-soluble samples. In acidic solution, caffeine reacts with

iodine to form an insoluble, brown-red complex. Excess iodine is then back titrated with sodium thiosulfate. This method is suitable for food and substances from which caffeine can be extracted with water (e.g., coffee).

In this Application Note, the caffeine content in aqueous samples is accurately and reliably analyzed by iodometric back titration using the OMNIS Titrator equipped with a dPt Titrode.

SAMPLES AND SAMPLE PREPARATION

This application is demonstrated on caffeine standard, guarana extract, guarana extract concentrate, ground coffee, and an energy drink.

An appropriate amount of sample is weighed

into an amber glass beaker. Deionized water, iodine solution, and sulfuric acid are added, and the caffeine-iodine complex is formed. Afterwards, the solution is filtered.

EXPERIMENTAL

An aliquot of the filtrate is titrated until after the first equivalence point with standardized sodium thiosulfate solution (**Figure 1**). The determination is carried out with an OMNIS Titrator equipped with a dPt Titrode (**Figure 2**).

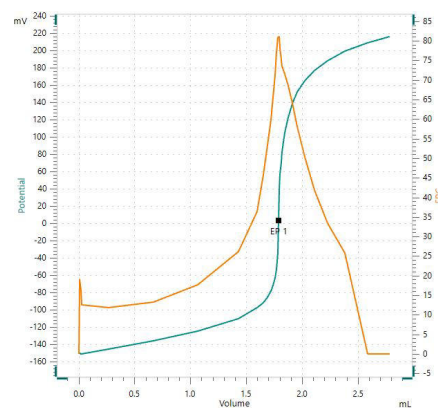


Figure 1. Exemplary titration curve of caffeine in an energy drink (Table 1) with sodium thiosulfate as titrant.



Figure 2. OMNIS Titrator equipped with a dPt Titrode electrode for the determination of caffeine content in aqueous samples.

RESULTS

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

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

Sample (n = 6)	Caffeine in %	SD(rel) in %
Caffeine standard	100.1	0.9
Guarana extract	4.2	2.0
Guarana extract concentrate	40.7	2.1
Ground coffee (roasted)	1.3	2.9
Energy drink	0.07	2.4

CONCLUSION

The iodometric back titration is a precise method used to accurately measure the caffeine content in various aqueous samples. Reliable determinations are made easy using the OMNIS Titrator equipped with a dPt Titrode. This system

offers flexible analyses combined with high-end software. The dPt Titrode is maintenance-free and suitable for redox titrations like iodometry when the pH value remains constant.

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

