Application Note AN-T-232

Determination of caffeine by iodometric back titration

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).

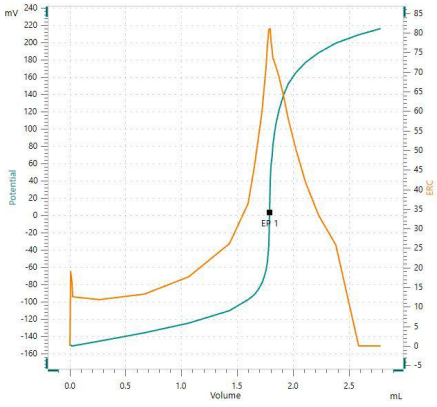

Figure 1. Exemplary titration curve of caffeine in an energy drink (Table 1) with sodium thiosulfate as titrant.

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

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。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
- 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,自生商的原始数据

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