



Application Note AN-T-233

通过滴定法测定焦磷酸盐

Fast and accurate potentiometric determination of pyrophosphates in aqueous samples

概要

Pyrophosphates, also known as diphosphates, are mainly used in food chemistry applications as emulsifiers. They also have other useful properties as preservatives, antioxidants, release agents, and leavening agents. Pyrophosphates can also act as complexing agents and acidity regulators and therefore have a wide range of uses.

However, pyrophosphates should only be used in limited quantities as they can cause severe

allergic reactions as well as lead to the onset of osteoporosis. The determination of pyrophosphate content in food and beverage products is therefore of interest.

In this Application Note, the pyrophosphate content in aqueous samples is accurately and reliably analyzed by automated titration using the OMNIS Sample Robot S and the OMNIS Titrator equipped with a dUnitrode.

SAMPLES AND SAMPLE PREPARATION

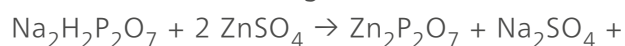
This application is demonstrated on different samples from potato processing baths. Sample

preparation is not required.

EXPERIMENTAL

An appropriate amount of sample is weighed into the titration beaker and deionized water is added. The pH is measured and then adjusted to between pH 3 and 6 if necessary.

In the first step after adding zinc sulfate, a pyrophosphate-complex and sulfuric acid are formed via the following reaction mechanism:



In the second step, the formed sulfuric acid is titrated with sodium hydroxide to determine the pyrophosphate content in the sample.

The determination is carried out with an OMNIS Titrator equipped with a dUnitrode on an OMNIS Sample Robot S (**Figure 1**).



Figure 1. OMNIS Sample Robot S equipped with an OMNIS Titrator, Dosing module, and dUnitrode electrode for the automated determination of pyrophosphate in aqueous samples.

This method offers very accurate results, as

displayed in **Table 1** and **Table 2**.

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

Sample (n = 3)	Pyrophosphate in %	SD(rel) in %
1	7.48	0.0
2	5.32	0.1
3	9.84	0.1
4	8.48	0.1
5	15.87	0.3

Table 2. Results of pyrophosphate determination in the samples from Table 1 – each spiked with 5.0 g/L Na₂H₂P₂O₇.

Sample with spike (n = 3)	Expected value in %	Recovery in %
1	12.48	99.2
2	10.32	100.0
3	14.84	98.6
4	13.48	97.8
5	20.87	101.4

CONCLUSION

Titration is an accurate and precise method that can be used to determine the pyrophosphate content in aqueous products. The OMNIS Titrator equipped

with a dUnitrode delivers reliable determinations. This automated system offers flexible analyses combined with high-end software.

CONTACT

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CONFIGURATION



OMNIS Sample Robot S Pick and Place

OMNIS Sample Robot S 具有一个“蠕动”泵模块(2通道)和一个 Pick&Place 模块以及大量附件,可直接进入全自动滴定。此系统具有两个样品盘位置,可用于 32 个 120 mL 的样品盘。此模块化系统供货时已完全安装完毕,因此可在极短时间内投入运行。

该系统也可根据需要扩展配备另外两台蠕动泵以及多加一个 Pick&Place 模块,由此使通量翻倍。如果需要更多工作台,则可将此 Sample Robot 扩展为 L 规格款型的 OMNIS Sample Robot,由此可使七个样品盘的样品在多达四个 Pick&Place 模块上并行处理,将样品通量扩大四倍。



OMNIS Professional Titrator

创新型、模块式电位分析 OMNIS Titrator,用于进行终点和等当点滴定(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
- 可以扩展磁力搅拌器和/或棒式搅拌器
- 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