Application Note AN-T-196

# Assay of Vitamin C

## Fast and accurate analysis according to USP <580>

Vitamin C, also known as ascorbic acid or L-ascorbic acid, is an essential nutrient involved in the repair of tissues and the enzymatic production of certain neurotransmitters. It is required for the functioning of several enzymes and immune performance, and is also an important antioxidant. This nutrient is found in many foods and is often used as a dietary supplement.

USP general chapter <580> describes a titration technique to determine the assay of Vitamin C as ascorbic acid, sodium ascorbate, and calcium ascorbate dehydrate, or their mixture in finished dosage forms as capsules, tablets, and oral suspensions.

This Application Note demonstrates the Vitamin C determination in water-soluble vitamin tablets. The methodology can also be applied for oil-soluble vitamin or mineral tablets, as well as oil- and water-soluble vitamin or mineral capsules.

## SAMPLE AND SAMPLE PREPARATION

The method is demonstrated for water-soluble vitamin tablets.
Several tablets are accurately weighed and then ground into a fine powder. A portion is transferred into a volumetric flask, to which metaphosphoric and acetic acid are added. After dissolution, the volumetric flask is filled up to the mark with carbon dioxide-free water.

## EXPERIMENTAL

This bivoltametric analysis is carried out on a 905 Titrando system equipped with a magnetic stirrer and a double Pt sheet electrode for indication.
To a reasonable amount of prepared sample, metaphosphoric acid, acetic acid, and carbon dioxide-free water are added. The vitamin C content is then titrated against dichlorophenol-indophenol until the first equivalence point.
A blank analysis is performed in the same way.

**Figure 1.** 905 Titrando with tiamo. Example setup for the determination of vitamin C.

## RESULTS

The analysis demonstrates acceptable and reproducible results and well-defined titration curves. For the tested water-soluble vitamin tablet, a vitamin C content of 97.7% (n = 6, SD(rel) = 0.23%) is obtained, which is within the given USP criteria of 90–150%. An example titration curve is displayed in Figure 2.

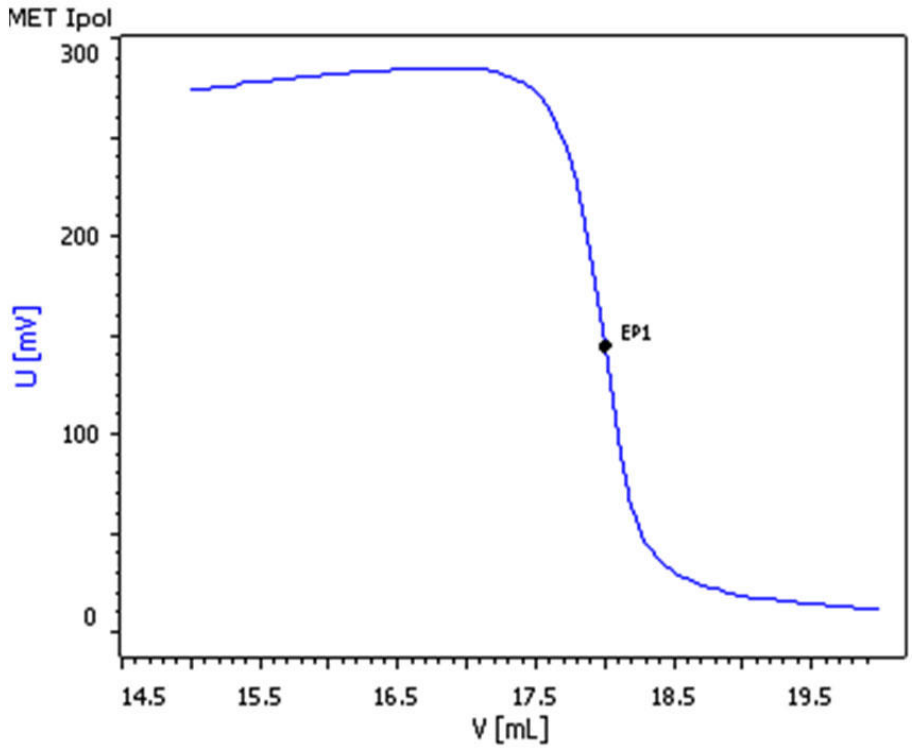


**Figure 2.** Example titration curve for vitamin C determination.

## CONCLUSION

After sample preparation, the determination of vitamin C in vitamin capsules or tablets can efficiently be carried out by using a Metrohm autotitrator. Fast and precise determination according to USP <580> is possible.

## REMARKS

This method is also suitable for samples such as:

- Oil- and water-soluble vitamins capsules
- Oil- and water-soluble vitamins oral solution
- Oil- and water-soluble vitamins tablets
- Oil- and water-soluble vitamins with minerals capsules
- Oil- and water-soluble vitamins with minerals oral solution
- Oil- and water-soluble vitamins with minerals tablets
- Water-soluble vitamins capsules
- Water-soluble vitamins tablets
- Water-soluble vitamins with minerals capsules
- Water-soluble vitamins with minerals tablets

## CONTACT

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## CONFIGURATION

OMNIS Advanced Titrator with magnetic stirrer

Innovative, modular potentiometric OMNIS Titrator for stand-alone operation or as the core of an OMNIS titration system for endpoint titration and equivalence point titration (monotonic/dynamic). Thanks to 3S Liquid Adapter technology, handling chemicals is more secure than ever before. The titrator can be freely configured with measuring modules and cylinder units and can have a rod stirrer added as needed. If required, the OMNIS Advanced Titrator can be equipped for parallel titration via a corresponding software function license.

- Control via PC or local network
- Connection option for up to four additional titration or dosing modules for additional applications or auxiliary solutions
- Connection option for one rod stirrer
- Various cylinder sizes available: 5, 10, 20 or 50 mL
- Liquid Adapter with 3S technology: Secure handling of chemicals, automatic transfer of the original reagent data from the manufacturer

Measuring modes and software options:

- Endpoint titration: "Basic" function license
- Endpoint and equivalence point titration (monotonic/dynamic): "Advanced" function license
- Endpoint and equivalence point titration (monotonic/dynamic) with parallel titration: "Professional" function license

### Double Pt sheet electrode

Glass shaft electrode with two platinum sheets (0.15 x 8 x 8 mm) which are polarized for redox titrations (bivoltammetric titration). This electrode is well suited for

- Vitamin C determination
- Coulometric nitrogen determination
- Bromine index
- Sulfurous acid ($SO_2$) in wine
- Oxygen content according to Winkler