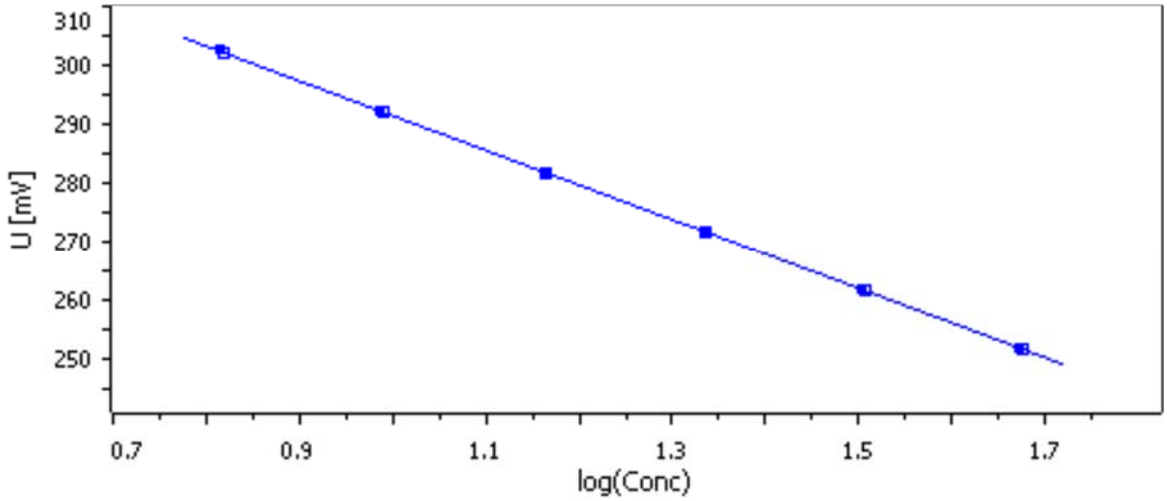
Titration Application Note I-010

Nitrate in carrot and beetroot juices

Fast and inexpensive analysis by standard addition



Nitrate is present in all common agricultural products and due to an extensive use of fertilizers, the nitrate content can be disconcertingly high in vegetables and their fabricated products, like juices. The nitrate content is regulated in many countries because it can form nitrosamines within the human body. Nitrosamines can potentially cause cancer and therefore, the World Health Organization (WHO) has defined an accepted daily intake (ADI) for nitrate of 3.7 mg/kg. To control the nitrate content e.g., in juices, a quick and inexpensive assessment of its concentration is performed via standard addition with a nitrate ion selective electrode. The method can be automated and is faster and less expensive compared to competing chromatographic or spectroscopic methods.

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Method description

Sample

Beetroot juice

Carrot juice

Sample preparation

Prior to the analysis, the juices are shaken well to ensure a homogeneous distribution of the sample matrix.

Configuration

Comb. polymer membrane electrode, NO_3	6.00510.120
Temperature sensor Pt1000	6.1110.100

Analysis

The nitrate content of vegetable juices can be determined by a standard addition.

Prior to analyzing a measurement series, the electrode was conditioned in potassium nitrate solution for 30 min.

For the standard addition, a nitrate standard solution is added to the sample until a predefined potential difference is reached. This is repeated between three and five times. The potential of the solution is measured prior to the first, as well as after each addition.

While working with ion selective electrodes, the ionic strength of the solution should remain constant. Therefore, an ionic strength adjuster (ISA) solution is added to the samples. For samples with a very high amount of disturbing ions, a suppressor solution (NISS) should be used in place of the ISA solution. Afterwards, the total volume is set to a predefined value. In between each measurement, the burette tips and sensors are rinsed with deionized water.

Results

Sample (n = 5)	Nitrate content (mg/L)	s(rel) / %
Carrot juice	164.9	0.7
Beetroot juice	824.9	1.5
Beetroot juice (with NISS)	816.8	1.1

Summary

The standard addition allows accurate quantification of the nitrate concentration in juices. The method is fast, inexpensive, and is not disturbed by the sample matrix. Furthermore, the combination of the 867 pH Module with the 814 USB Sample Processor allows a high sample throughput.

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