

# Nitrogen (total) in effluents

Photometric determination after decomposition with potassium peroxodisulfate with the thermoreactor

## Introduction

Excess nitrogen in effluents can be problematic because it can lead to contamination of groundwater and subsequent environmental problems. One of these issues is eutrophication—excessive growth of algae and plants—which can adversely affect aquatic ecosystems.<sup>1</sup> Total nitrogen in effluents consists of both organic and inorganic nitrogen, including ammonium, nitrite and nitrate. As a result, monitoring nitrogen is critical for environmental reasons. Here we describe the photometric determination of nitrate in effluents using the Spectroquant<sup>®</sup> system and test kits.

## Experimental

### Method

Organic and inorganic nitrogen compounds are transformed into nitrate according to Koroleff's method by treatment with an oxidizing agent in a thermoreactor. In a solution acidified with sulfuric and phosphoric acid, this nitrate reacts with 2,6-dimethylphenol (DMP) to form 4-nitro-2,6-dimethylphenol that is determined photometrically. The digestion is analogous to EN ISO 11905-1. The determination of nitrate is analogous to DIN 38405-9.

## Reagents and Instruments

Cat. No.	Product Description
<b>Test Kits</b>	
1.14537	Nitrogen (total) Cell Test Method: photometric 0.5 - 15.0 mg/l N Spectroquant <sup>®</sup> or
1.00613*	Nitrogen (total) Cell Test Method: photometric, DMP 0.5 - 15.0 mg/l N Spectroquant <sup>®</sup> or
1.14763*	Nitrogen (total) Cell Test Method: photometric, DMP 10 - 150 mg/l N Spectroquant <sup>®</sup>
<b>Instruments</b>	
1.73026	Spectroquant <sup>®</sup> VIS Spectrophotometer Prove 100 plus or
1.73027	Spectroquant <sup>®</sup> UV/VIS Spectrophotometer Prove 300 plus or
1.73028	Spectroquant <sup>®</sup> UV/VIS Spectrophotometer Prove 600 plus or
1.09748	Spectroquant <sup>®</sup> Photometer NOVA 30 or
1.09751	Spectroquant <sup>®</sup> Photometer NOVA 60 or
1.09752	Spectroquant <sup>®</sup> Photometer NOVA 60A or
1.73632	Spectroquant <sup>®</sup> Colorimeter Move 100 or
	Thermoreactor with 120 °C digestion temperature
<b>Materials</b>	
1.14946	Rectangular cells 10 mm and/ or
1.14947	Rectangular cells 20 mm and/ or
1.14944	Rectangular cells 50 mm

\*not compatible with Move 100

Also first generation Prove instruments are compatible and preprogrammed with this method.

## Analytical Approach

The content of total nitrogen can be rationally measured after decomposition according to the Koroleff method in the thermoreactor with alkaline peroxodisulfate solution. The method is restricted by the content of organic compounds, expressed as the COD content. For the decomposition of samples in the thermoreactor, the maximum COD concentration must not exceed 300 mg/l. Very slightly oxidizable Nitrogen compounds are only partly measured.

### Sample preparation

The sample, pH 5 - 9, with a COD value smaller than 300 mg/l is treated as per the instructions of the Spectroquant® Nitrogen Cell Test given. The sample is digested in a closed round-cell in the thermoreactor. After digestion the sample must be checked, as specified, for freedom from peroxides; any peroxides present must be destroyed with sodium sulfite.

### Analysis

Determine with the above-mentioned test kits.

### Calculation

Nitrogen (total) content in mg/l N = analysis value in mg/l N

## References

1. Camargo JA, Alonso A. Ecological and toxicological effects of inorganic nitrogen pollution in aquatic ecosystems: A global assessment. *Environ Int.* Aug 2006;32(6):831-49. doi:10.1016/j.envint.2006.05.002.

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