

 **T.C.**

**ÇANAKKALE ONSEKİZ MART UNIVERSITY**

**FACULTY OF ENGINEERING**

**DEPARTMENT OF ENVIROMENTAL ENGINEERING**

**ENVIROMENTAL CHEMISTRY LABORATORY II**

**Names, Surnames:**

**Student No’s:**

**Group:** 1

**Date of Experiment:**

**Date of Report Submission:**

**Number of Experiment:**

**Name of Experiment:**

**Objective:**

**How to Write a Lab Report**

|  |  |
| --- | --- |
| **Report Sections** |  Explanation |
| **A.1 Title Page** | In this section, you describe what you are trying to find and why. Background and motivation are used to provide the reader with a reason to read the report. |
| **A.2 Table of Contents** |
| **A.3 Introduction** |
| · Background / Theory |
| · Purpose |
| · Governing Equations |
| **A.4 Methods** | In this section, you explain how question addressed is answered. Clearly explain your work so it could be repeated. |
| · Experiment Overview |
| · Apparatus |
| · Equipment Table |
| · Procedures |
| **A.5 Results** |  together with narrative, like a story.In this section, you present the results of your experiment. Tables, graphs, and equations are used to summarize the results. Link equations and visuals Remember your audience. |
| · Narrate (like a story) |
| · Tables and Graphs |
| · Equations in Variable |
| Form |
| · Uncertainties |
| · Units! |
| · Indicate Final Results |
| **A.6 Discussion** | In this section, you explain and interpret your results. Insert your opinion, backed by results. Discuss issues you had and how this could be corrected in the future. The conclusion is a summary of your results and discussion. |
| · Answer DQ |
| · Theoretical Comparison |
| · Explanation of Anomalies / Error |
| · Conclusion / Summary |
| · Future Work |
| **A.7 References** |   |

**Example of a Lab Report (Özellikle Yazım özelliklerine, sayfa yapısına ve referanslara dikkat edin, Her eksik yazdığınız kısım için de puan düşecektir.)**

**OUR TABLE PAGE**

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**Student No:** 150212001

**Section:** 1

**Group:** 1

**Date of Experiment:** 17.04.2013

**Date of Report Submission:** 24.04.2013

**Number of Experiment: 7**

**Name of Experiment:** Determination of nitrite nitrogen

**Objective:** Determining nitrite nitrogen by diazotization method

**Table of Content:**

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**1. Theory**

Nitrate (NO3-) and nitrite (NO2-) are naturally occurring inorganic ions that are part of the nitrogen cycle. Microbial action in soil or water decomposes wastes containing organic nitrogen into ammonia, which is then oxidized to nitrite and nitrate. Nitrate is used widely in inorganic fertilizers and it is the more stable of the two forms of nitrogen because nitrite is easily oxidized to nitrate [1].

In freshly polluted waters, most of the nitrogen is present in the form of organic (protein) nitrogen and ammonia. As time progresses, the organic nitrogen is gradually converted to ammonia nitrogen and later if aerobic conditions are present, oxidation of ammonia to nitrite and nitrate occurs. Under anaerobic conditions nitrate and nitrite are both reduced by denitrification. Nitrate is reduced to nitrite and then reduction of nitrite occurs. Reduction of nitrite is carried to ammonia by a few bacteria for protein formation but mostly the nitrate is reduced to nitrogen gas which escapes to the atmosphere. In the following part, the nitrification (equations 1 and 2) and denitrification (equations 3) reactions are given [2]:

2NH3 + 3O2 🡪 2NO2- + 2H+ + 2H2O (equations 1)

2NO2- + O2 🡪 2NO3- (equations 2)

NO3- + 5/6 CH3OH 🡪 1/2 N2 + 5/6 CO2 + 7/6 H2O + OH- (equations 3)

Nitrate can reach to surface water and groundwater as a consequence of agricultural activity, from wastewater treatment and from oxidation of nitrogenous waste products in human and animal excreta, including septic tanks. Nitrite can also be formed chemically in distribution pipes by Nitrosomonas bacteria during stagnation of nitrate containing and oxygen poor drinking water in galvanized steel pipes or if chloramination is used to provide a residual disinfectant and the process is not sufficiently well controlled [3]. According to US EPA, nitrate-N standard is 10 ppm and nitrite-N standard is 1 ppm [4].

Nitrite nitrogen concentration in surface waters and groundwaters is normally much below 0.1 mg/L. For this reason sensitive methods are needed for its measurement. The colorimetric procedure provides this sensitivity. However another standard procedure is an instrumental approach using ion chromatography. Several anions can be determined simultaneously on a single sample by ion chromatography but the colorimetric procedure is cheaper and preferred when analysis for nitrite alone is desired or nitrite concentrations are especially low [2].

In the colorimetric procedure a modiﬁcation of the Griess-Ilosvay diazotization method is used. This employs the use of two organic reagents: sulfanilamide and N-(1 naphthyl)-ethylenediamine dihydrochloride. Under acid conditions, nitrite ion as nitrous acid reacts with an amino group of sulfanilamide to form a diazonium salt that combines with N-(1-naphthyl)-ethylenediamine dihydrochloride to a bright-colored, pinkish-red azo dye. The color produced is directly proportional to the amount of nitrite nitrogen present in the sample and determination of the amount can be made by comparison with color standards or by means of photometric measurement. Photometric measurement is preferred because standards for visual comparison are not permanent and must be prepared each time analyses are performed [2].

**2. Procedure**

1. 10 ml of an unknown sample in a volumetric flask is taken by graduated cylinder and put in the sample cell.

2. Nitrite reagent powder pillow is added into the sample cell. The cell is mixed carefully. Pink color is developed. The outer walls of the sample cell is cleaned. 15 minutes of reaction period is waited.

3. 10 ml of the sample is taken by graduated cylinder and put in the sample cell (Blank). The outer walls of the sample cell is cleaned.

4. High range nitrite nitrogen method is selected in the spectrophotometer.

5. Blank sample is put in the spectrophotometer and zero is pressed.

6. The sample is put in the spectrophotometer. The result is read as 17 mg/L NO2.

**3. Reagents**

Nitrite reagent powder pillow

 **4. Apparatus**

Volumetric flask

Graduated cylinder

Sample cells

Spectrophotometer (HACH DR 2500)

**5. Results**

The result is read as 17 mg/L NO2.

**6. Discussion**

Why NO2- parameter is important, especially for drinking water?

Nitrite is easily oxidized to nitrate. As a result, nitrate is more predominant form of nitrogen compared to nitrite. However, nitrate can be reduced by microbial action to nitrite, which is the more toxic form [1].

The major health risk from nitrate/nitrite is to infants under 6 months of age. At this early stage of development, nitrate in the body is transformed to nitrite which reacts with hemoglobin and prevents transport of oxygen. The result is a decreased oxygen supply to the body, often called blue baby syndrome (or methemoglobinemia). Adults are at low risk from this syndrome but adults with chronic health problems such as heart or lung disease or enzyme deficiencies may be at higher risk from elevated nitrate/nitrite levels. Pregnant and nursing mothers are also at risk group because of potential effects passed on to the fetus or infant. There are a few studies suggesting high nitrate/nitrite may cause certain types of cancer, but this connection is not well understood [4].

**7. References**

1. <http://www.ccme.ca/sourcetotap/nitrates.html> (Date of access: 22.04.2013)

2. Sawyer, C.N., McCarty, P.L., Parkin, G.F. “Chemistry for Environmental Engineering and Science” 5th ed., McGraw-Hill, 2003.

3. <http://www.who.int/water_sanitation_health/dwq/chemicals/nitratenitrite2ndadd.pdf> (Date of access: 22.04.2013)

4. <http://waterquality.montana.edu/docs/homeowners/nitrate_fact_sheet.shtml> (Date of access: 22.04.2013)