# **REPORT**

**EXPERIMENT 3: REDOX TITRATION**

Group: 3 Class: IELS22IU41 Date: 17/1/2023

Group members:

|  | Full name | Student ID | Declaration of Contribution | Signature |
| --- | --- | --- | --- | --- |
| 1 | Phan Minh Ẩn | ITITSB22028 | Introduction and Materials & Methods and Calculations of each experiment |  |
| 2 | Nguyễn Thành Trí | IELSIU22112 | Calculation about the standardization of prepared KMnO4 solution |  |
| 3 | Đỗ Minh Duy | ITITSB22029 | Discussion of determination of unknown concentration H2C2O4 solution |  |
| 4 | Nguyễn Phan Tuấn Anh | BTFTIU22164 | Discussion of determination of unknown concentration FeSO4 solution |  |
| 5 | Nguyễn Quốc Tuấn | ITITIU22177 | Calculation of determination of unknown concentration FeSO4 solution |  |

Total score: \_\_\_\_\_\_\_/100

**Part 1. Introduction**

The exchange of electrons from one species to another occurs during oxidation-reduction processes, sometimes referred to as redox reactions. It is referred to as being oxidized when a species loses electrons and reduced when a species acquires them. Additionally, there are terms like "gram equivalent mass" and "gram equivalent weight" that are used (The mass of the given substance which will combine with or displace a fixed quantity of another substance). So, through researching redox processes, we want to establish the normalcy of oxalic acid and normalize the content of KMnO4 solution.

**Part 2. Materials and Methods**

**Materials**

* *Lab equipment*
* Burette
* Erlenmeyer Flask
* Funnel
* Graduated cylinder
* Thermometer
* Volumetric pipette
* Beakers
* Water bath
* *Materials*
* KMnO4
* 0.05N H2C2O4
* distilled water
* 6N H2SO4
* Unknown concentration solution of oxalic acid (H2C2O4)
* Unknown concentration solution of FeSO4 in H2SO4

**Methods**

* **For experiment 1: Handling with Burette**

Step 1: Rinse the burette 3 times with distilled water.

Step 2: Rinse the burette 1 times with approximately 5ml KMnO4

Step 3: Discard the waste

Step 4: Fill with KMnO4. Let it drain through the burette tip

Step 5: Record the point

* **For experiment 2: Standardization of prepared KMnO4 solution**

With section 1: Preparation

Step 1: Add 25ml of 0.05N H2C2O4 into beaker

* Step 2: Add 10ml of 0.05N H2C2O4 from the beaker into the conical flask 1 and 2, continually add 40ml of distilled water and 20ml of 6N H2C2O4 into each flask.

With section 2: Titration

Step 1: Heat the flask to approximately 85 to 90℃

Step 2: Record the initial point

Step 3: Add KMnO4 slowly and swirl the flask continuously

Step 4: First sign of the color change (light pink), stop titration

Step 5: Record the final point

Step 6: Calculate VKMnO4

* **For experiment 3: Determination of unknown concentration H2C2O4 solution**

With section 1: Preparation

Step 1: Add 25ml unknown normality of H2C2O4

Step 2: Add 10ml of unknown normality H2C2O4 from the beaker into the conical flask #1 and #2, continually add 40ml of distilled water and 20ml of 6N H2C2O4 into each flask.

With section 2: Titration

Step 1: Heat the flask to approximately 85 to 90℃

Step 2: Record the initial point

Step 3: Add KMnO4 slowly and swirl the flask continuously

Step 4: First sign of the color change (light pink), stop titration

Step 5: Record the final point

Step 6: Calculate VKMnO4

* **For experiment 4: Determination of unknown concentration FeSO4 solution**

With section 1: Preparation

Step 1: Add 25ml of unknown normality of FeSO4

Step 2: Add 10ml of unknown normality FeSO4 from the beaker into the conical flask 1 and 2, continually add 40ml of distilled water and 20ml of 6N H2C2O4 into each flask.

With section 2: Titration

Step 1: Heat the flask to approximately 85 to 90℃

Step 2: Record the initial point

Step 3: Add KMnO4 slowly and swirl the flask continuously

Step 4: First sign of the color change (light pink), stop titration

Step 5: Record the final point

Step 6: Calculate VKMnO4

**Part 3. Results and Discussion**

**1. STANDARDIZATION OF PREPARED KMnO4 SOLUTION**

**Calculation:**

Normality of the standard H2C2O4 solution, **N**(H2C2O4) = \_\_\_\_\_\_\_0.05\_\_(N)\_\_\_\_\_\_\_\_\_\_

Volume of the standard H2C2O4 solution used, **V**(H2C2O4) = \_\_\_\_\_\_\_10\_ml\_\_\_\_\_\_\_\_\_\_\_

| **Trial #** | **Burette reading (mL)** | **Volume of KMnO4 (mL)** | **Normality of KMnO4 (N)** |
| --- | --- | --- | --- |
| 1 | 9.7-19 | 9.3 ml | 0.053 |
| 2 | 0.1-9.7 | 9.6 ml | 0.052 |

**Average Normality of KMnO4 =** \_\_\_0.0525\_\_\_(N)\_\_\_\_\_\_

**Discussion:**

**2. DETERMINATION OF UNKNOWN CONCENTRATION H2C2O4 SOLUTION**

**Calculation:**

Normality of the standard KMnO4 solution, **N**(KMnO4) = 0.0525

Volume of the unknown H2C2O4 solution used, **V**(H2C2O4) = 10ml

| **Trial #** | **Burette reading (mL)** | **Volume of KMnO4 (mL)** | **Normality of H2C2O4 (N)** |
| --- | --- | --- | --- |
| 1 | 19-23.8 | 4.8 | 0.0252 |
| 2 | 23.8-28.6 | 4.8 | 0.0252 |

We have: V(H2C2O4) x N(H2C2O4) = V(KMnO4) x N(KMnO4)

Normality of the standard H2C2O4 solution,

**Trial 1: N**(H2C2O4) = V(KMnO4) x N(KMnO4) = 4.8\*0.0525 = 0.0252 (N)

V(H2C2O4) 10

**Trial 2: N**(H2C2O4) = V(KMnO4) x N(KMnO4) = 4.8\*0.0525 = 0.0252 (N)

V(H2C2O4) 10

**Average Normality of H2C2O4 =** 0.0252 + 0.0143 = 0.0147 ± 4\*10-4 (N)

2

**Discussion:**

The attribute of the second experiment is the same as the experiment. The amount of KMnO4 measured after the Normality of H2C2O4 is the only thing that has changed:

5H2C2O4 + 2KMnO4 + 3H2SO4 → 10CO2 + 2MnSO4 + K2SO4 + 8H2O

**3. DETERMINATION OF UNKNOWN CONCENTRATION FeSO4 SOLUTION**

**Calculation:**

Normality of the standard KMnO4 solution, **N**(KMnO4) = 0.0525

Volume of the unknown FeSO4 solution used, **V**(FeSO4) = 10ml

| **Trial #** | **Burette reading (mL)** | **Volume of KMnO4 (mL)** | **Normality of FeSO4 (N)** |
| --- | --- | --- | --- |
| 1 | 30-31.2 | 1.2 | 0.0063 |
| 2 | 31.2-32.5 | 1.3 | 0.006825 |

We have: V(H2C2O4) x N(H2C2O4) = V(KMnO4) x N(KMnO4)

Normality of the standard H2C2O4 solution,

**Trial 1: N**(H2C2O4) = V(KMnO4) x N(KMnO4) = 1.2\*0.0525 = 0.0063 (N)

V(H2C2O4) 10

**Trial 2: N**(H2C2O4) = V(KMnO4) x N(KMnO4) = 1.3\*0.0525 = 0.006825 (N)

V(H2C2O4) 10

**Average Normality of FeSO4 =**  (N) **=** 0.00656

**Discussion:**

* The outcome is consistent with the theory that stated: "At the equivalency point, the solution will change color from dark purple to a light pink due to reduction of purple permanganate ion to the colorless Mn+2 ion."
* The burette's initial and final readings are recorded and repeated three times, along with the rough titration; the final burette reading is fixed to all of the titration; thus, the results of this experiment are reliable.

**Part 4. Conclusions**

By measuring the total volumes of a solution and the standardized solution required for the reaction, we can use titration to determine the solution's unknown concentration.

Three of the four variables will be known at the conclusion of the titration, and the fourth variable can be identified using the equation : Voxidizing x Noxidizing = Vreducing x Nreducing

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END.