Aim 32

To Determine the Chemical Oxygen Demand (COD) of Water Sample

Introduction

The amount of O_2 (mg/l) that is required to oxidized all compounds (both organic and inorganic) in water is termed as COD.

The amount of chemically oxidisable matter (whether biodegradable or not) present in water sample is given by COD. It is always higher than BOD. For growth and multiplication of microbes best medium is organic matter.

The amount of organic matter in water samples can be determined by oxidizing the organic matter with chemical oxidant like potassium dichromate of known volume. Combine KI with excess of oxygen and free I_2 will be liberated and the amount of I_2 will be equal to that of excess oxygen. By titrating with sodium thiosulphate solution using starch as an indicator, the amount of free I_2 can be estimated.

Requirments

1. Burette
2. Organic matter + potassium dichromate solution(excess)
3. Water collected from different sources
4. Potassium iodide solution 10%
5. Sodium thiosulphate solution - 0.1N
6. Starch solution - 1%
7. Potassium dichromate solution - 0.1M

8. Sulphuric acid - 2 M

$$\text{Excess [O]} + KI + H_2SO_4 \downarrow I_2 + K_2SO_4 + H_2O$$

$$I_2 + 2Na_2S_2O_3 \rightarrow 2NaI + Na_2S_4O_6$$

Sodium thiosulphate - 0.1 N

24.82 g of $Na_2S_2O_3.5H_2O$ is dissolved in 1 L of water.

To check its normality, 20 ml of 0.5 N potassium dichromate solution is taken and 10 ml of 10 % KI and 5 ml of HCl is also added. Add distilled water to make the volume to 100 ml. Further, titration is done with thiosulphate solution, just the permanent yellow colour appears with the addition of fewer drops of starch solution by the titration. If blue colour appears, titration is continued till blue colour disappears. Measure the volume of thiosulphate solution used and determine its exact normality by applying the formula.

$$\underset{\text{(Sodium thiosulphate)}}{N_1 V_1} = \underset{\text{(Potassium dichromate)}}{N_2 V_2}$$

N_1 = normality of the sodin thiosulphate

V_1 = volume of sodium thiosulphate solution used

N_2 = normality of potassium dichromate (0.1N)

V_2 = volume of potassium dichromate solution taken for titration

$N_1 = (N_2 V_2)/ V_1$

$= 0.1 \times 20 / V_1$

Procedure

1. 50 ml sample in duplicate in separate conical flasks is taken.
2. 50 ml of distilled water in duplicate in separate conical flasks is taken.

3. 5 ml of potassium dichromate solution in each flask is added.
4. Place the flask on boiling water bath for 1 hour.
5. Keep them to cool and 5 ml of KI solution and 10 ml of H_2SO_4 acid solution in each flask is added.
6. Use Standard sodium thiosulphate solution for titration till the straw yellow colour appears.
7. Few drops of starch solution in each flask are added.
8. Again titrate it (if blue colour appear) with sodium thiosulphate till blue colour disappear.
9. Write down the reading on the burette before and after the titration.
10. Write down the volume of sodium thiosulphate used for each sample.

Observation Table

Sr No.	Volume of sodium thiosulphate used (ml)	Volume of sodium thiosulphate used (ml)	Mean
1 2 3 4 5 6 Blank			

Result

$$COD\ (mg/L) = \{8x\ C(T-B)\}/\ W$$

Since, 1 ml of .025 mg sodium thiosulphate solution is equivalent to 0.2 mg oxygen

C = concentration of titrant, m mol/L)

T = volume of titrant used for sample (ml)

B = volume of titrant used for blank (ml)

W = volume of water sample taken (ml)

As polluted water sample contains various different types of toxic compounds which may effect the estimation of BOD value. So, COD gives better estimation of content of the organic matter present in the water sample because.