Experiment No.: 6

Estimation of dissolved oxygen (D.O.) of given water sample.

Apparatus required:

1) B.O.D. bottles, 2) Conical flasks, 3) Burette, 4) Pipette

Chemical required:

1) Manganese (II) sulphate
2) Sodium azide
3) Potassium iodide
4) Sodium hydroxide
5) Starch, potassium fluoride
6) Sodium thiosulphate

Theory:

Dissolved Oxygen (D.O.) is the content of oxygen dissolved in water. Dissolved Oxygen (DO) is an important parameter of water and is essential to maintain the aquatic life. Dissolved oxygen comes in water from two ways.

1. By continuous diffusion from air

   It is a physical process and depends upon temperature, salinity of water, movement of water etc.

2. By photosynthetic activities of aquatic organism.

   The photosynthetic activities depend upon availability of light, types and number of aquatic organism etc.

Adequate dissolved oxygen allows the aerobic process to go on but the inadequate DO will cause anaerobic activities to start. DO is depleted by discharge of oxygen. Oxidation of organic compounds

or the inorganic substance such as hydrogen sulfide, ferrous ion, nitrates, nitrites etc. proceed with decrease in dissolved oxygen in water. It indicate the pollution of water. Sometimes, the load of organic wastes in water is high so DO may totally disappear from water which is termed as entrophic condition and the process is called entrophication.

The determination of DO present in waste water is very important because while discharging the sewage into a river or a stream or a lake, it is necessary to ensure at least 4 ppm of DO in it so as to maintain life in the sewage receiving water. DO is also an indicator for pollution in water. The water used for drinking purpose should have a minimum of 4 mg/l of oxygen.

In Winkler Method, DO is allowed to react with KI to form iodine, which is then titrated with standard sodium thiosulphate solution. A fast quantitative reaction is ensured by the addition of Mn(II) salts in a strongly alkaline medium:

$$Mn^{2} + 1/2\ O_2 + 2OH \rightarrow MnO_2 \downarrow + H_2O$$

$$MnO_2 + 2I^{-} + 4H^{+} \rightarrow Mn^{2+} + I_2 + 2H_2O$$

$$I_2 + 2S_2O_3^{2} \rightarrow 2I^{-} + S_4O_6^{2}$$

Procedure:

Collect samples of water in 125 ml B.O.D. bottles without air bubbles. Add 1 ml of Manganese (II) sulphate, alkali iodide azide and potassium fluoride solution to each of them. Put stopper carefully to exclude air bubbles and mix thoroughly by inverting the bottle a few times. Add 1 ml of conc. sulphuric acid when the precipitate has settled down. Put the stopper carefully and invert the bottle several times until the dissolution of the precipitate is complete. Pour the sample from BOD bottle to a conical flask and add 2-3 drops of starch solution. Titrate it with standard sodium thiosulphate solution where the disappearance of blue color indicates the end point.

Observation Table

S. No.	Volume of water Sample (ml), S	Volume of thiosulphate solution (ml), A	Total volume of $MgSO_4$, KF and Alkali iodide azide solution (ml), C
1.			
2.			
3.			

Calculation:

$$\text{Dissolved Oxygen (mg/l)} = \frac{A.N.8}{S - C} \times 1000$$

Where, A = ml of 0.025 N thiosulphate solution consumed

N = Normality of standard thiosulphate solution

C = Total volume of potassium Manganese (II) sulphate solution, alkali iodide azide solution, potassium fluoride solution

S = Volume of water sample

Results: