

## **Protection against corrosion using cathodic protection**

### **Procedure:**

- 1- weigh two sheets of steel (dry and clean from oxide).
- 2- Immerse one sheet of steel in 200mL solution containing saturated ammonium chloride solution for 45 minutes.
- 3- In the same time couple the other sheet with (dry clean from oxide) zinc sheet of the same dimension then immerse them in 200mL solution containing saturated ammonium chloride solution for 45 minutes.
- 4- wash each sheet using distilled water then dry with filter paper.
- 5- Reweight the two sheets of steel.

### **Calculation:**

Rate of corrosion = weight loss / area.time (gm/cm<sup>2</sup>.min)

R<sub>1</sub> = (gm/cm<sup>2</sup>.min)

R<sub>p</sub> = (gm/cm<sup>2</sup>.min)

Degree of protection =  $(R - R_p / R) \cdot 100$

### **Where:**

R is rate of corrosion of unprotected sheet.

R<sub>p</sub> is rate of corrosion of protected sheet.

### Dissolved Oxygen

In the first step, [Manganese\(II\) sulfate](#) (at 48% of the total volume) is added to an environmental water sample. Next, [Potassium iodide](#) (15% in [potassium hydroxide](#) 70%) is added to create a pinkish-brown precipitate. In the alkaline solution, dissolved oxygen will oxidize manganese(II) ions to the [tetravalent](#) state.

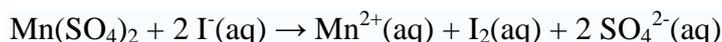


$\text{MnO(OH)}_2$  appears as a brown [precipitate](#). There is some confusion about whether the oxidised manganese is tetravalent or [trivalent](#). Some sources claim that  $\text{Mn(OH)}_3$  is the brown precipitate, but hydrated  $\text{MnO}_2$  may also give the brown colour.

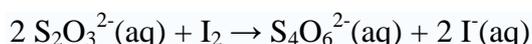


The second part of the Winkler test reduces and acidifies the solution. The precipitate will dissolve back into solution. The acid facilitates the conversion of the brown, Manganese-containing precipitate of the Iodide ion into elemental Iodine.

The  $\text{Mn(SO}_4)_2$  formed by the acid converts the iodide ions into [iodine](#), itself being reduced back to manganese(II) ions in an acidic medium.

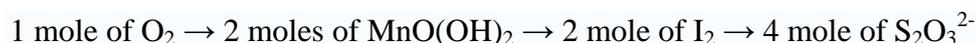


Thiosulfate solution is used, with a starch indicator, to [titrate](#) the iodine.



### [\[edit\]](#) Analysis

From the above [stoichiometric](#) equations, we can find that:



Therefore, after determining the number of moles of iodine produced, we can work out the number of moles of oxygen molecules present in the original water sample. The oxygen content is usually presented as  $\text{mg dm}^{-3}$ .

## **Determination of the inhibition efficiency for corrosion inhibitors**

### **Procedure:**

- 1-weigh two sheets of steel (dry and clean from oxide).
- 2-Immerse one sheet of steel in 200mL solution containing (1 molar ferric chloride and 0.25 molar hydrochloric acid) for 30 minutes.
- 3-Immerse the other sheet of steel in 200mL solution containing (1 molar ferric chloride and 0.25 molar hydrochloric acid and 1% glycerol) for 30 minutes.
- 4-wash both sheets with distilled water then dry with filter paper.
- 5-reweight the two sheets of steel.

### **Calculation:**

Rate of corrosion= weight loss/ area.time (gm/cm<sup>2</sup>.min)

R<sub>1</sub>= (gm/cm<sup>2</sup>.min)

R<sub>p</sub>= (gm/cm<sup>2</sup>.min)

Degree of protection= (R – R<sub>p</sub> / R). 100

### **Where:**

R is rate of corrosion of uninhibited sheet (solution not contain inhibitor).

R<sub>p</sub> is rate of corrosion of inhibited sheet (solution not contain inhibitor).

## **Protection against corrosion using passivation**

### **Procedure:**

- 1-weigh two sheets of steel ( dry and clean from oxide).
- 2-passivate only one of them in 200ml of solution containing (20 g/L sodium hydroxide and 50 g/L potassium dichromate) for 15minutes at room temperature.
- 3-Immerse each sheet of steel in 200mL solution containing saturated ammonium chloride solution for 45minutes.
- 4-wash both sheets with distilled water then dry with filter paper.
- 5-reweight the two sheets of steel.

### **Calculation:**

Rate of corrosion= weight loss/ area.time (gm/cm<sup>2</sup>.min)

R<sub>1</sub>= (gm/cm<sup>2</sup>.min)

R<sub>p</sub>= (gm/cm<sup>2</sup>.min)

Degree of protection=  $(R - R_p / R) \cdot 100$

### **Where:**

R is rate of corrosion of unpassivated sheet.

R<sub>p</sub> is rate of corrosion of passivated sheet.