

**NATIONAL INSTITUTE OF TECHNOLOGY**  
**NIT SRINAGAR (HAZRATBAL)**  
**Water Quality Lab**  
**701-P**  
**Laboratory Experiment 4**

**Experiment 4: Determination of chloride concentration in a sample of water**

**Background:**

Chloride in the form of chloride ( $\text{Cl}^-$ ) ion is one of the major inorganic anions in water and wastewater. The chloride concentration is higher in wastewater than in raw water because sodium chloride is a common article of diet and passes unchanged through the digestive system (Average estimate of excretion: 6 g of chlorides/person/day; additional chloride burden due to human consumption on wastewater: 15 mg/L). Along the sea coast chloride may be present in high concentration because of leakage of salt water into the sewage system. It also may be increased by industrial process. In potable water, the salty taste produced by chloride concentration is variable and depends on the chemical composition of water. Some waters containing 250 mg/L  $\text{Cl}^-$  may have a detectable salty taste if sodium cation is present. On the other hand, the typical salty taste may be absent in waters containing as much as 1000 mg/L when the predominant cations are calcium and magnesium. In addition, a high chloride contents may harm metallic pipes and structures as well as growing plants.

The measured chloride ions can be used to know salinity of different water sources. For brackish water (or sea water or industrial brine solution), it is an important parameter and indicates the extent of desalting of apparatus required. It also interferes with COD determination and thus it requires a correction to be made on the basis of amount present or else a complexing agent, such as  $\text{HgSO}_4$  can be added. Further, chloride ions are used as tracer ions in column studies to model fate of different contaminants in soil and liquid media.

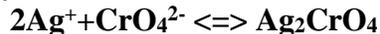
**Lab Procedure**

The Mohr Method uses silver nitrate for titration (normality: 0.0141) This corresponds to **1 mL of 0.0141 equals to 1 mg chloride in solution.** The silver nitrate solution is standardized against standard chloride solution, prepared from sodium chloride ( $\text{NaCl}$ ). During the titration, chloride ion is precipitated.



The indicator (potassium chromate) is added to visualize the endpoint, demonstrating presence of excess silver ions. In the presence of excess silver ions, solubility product of silver chromate

exceeded and it forms a reddish-brown precipitate This stage is taken as evidence that all chloride ions have been consumed and only excess silver ions have reacted with chromate ions:



**The silver chromate produced is responsible for imparting brick red color to the solution**

**Apparatus:** Burette, conical flask, pipette, measuring cylinder

**Reagents:** Potassium chromate indicator solution, standard silver nitrate as a titration agent..

**Steps:**

1. Take 50 ml of sample in a conical flask.
2. Add 1.0 ml indicator solution, ( Potassium chromate )
3. The initial color of the mixture is slight yellow
4. Titrate with standard silver nitrate solution to brick red end point and note down volume of titrant used.
5. Calculate chloride ion concentration using the equation :-:

**Chloride Ion Concentration (mg/L) = ( ML of AgNO<sub>3</sub> used-0.2) X500 / ML of sample used**

**Precautions:**

1. A uniform sample size must be used, preferably 50 ML, so that ionic concentrations needed to indicate the end point will be constant.
2. The pH must be in the range of 7 to 8 as silver ions are precipitated as AgOH at high pH levels and the chromate ions are converted to Cr<sub>2</sub>O<sub>7</sub><sup>2-</sup> at low pH values.
3. A definite amount of indicator must be used to provide a certain concentration of chromate ions, otherwise silver chromate may form too soon or not soon enough.
4. Caution should be made to notice indicator color change as it can varies person-to-person. The titrant should be added drop wise and the sample shaken constantly.
5. Take at least three readings for each sample.

**Answer the questions also (for Submission with Lab report):**

1. Does the measured chloride ion concentration exceed the maximum concentration criteria? Compare your values with IS:- 10050 to determine whether the determined chloride content is within permissible limits.
2. What is the permissible value of Chlorides for drinking water ?
3. What does excess of Chloride content in drinking water indicate ?

**NOTE:- Use the Link :-** [https://www.youtube.com/watch?v=Set3XdRshGo&ab\\_channel=Engineersinc](https://www.youtube.com/watch?v=Set3XdRshGo&ab_channel=Engineersinc).