



Study of Physical and Chemical Properties of Ground Water in Region Subhash Nagar, Wadgaon, District- Yavatmal

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ABSTRACT

The present work deals with the study of Physical and chemical properties of water in region, Subhash Nagar, Wadgaon, District- Yavatmal. The ground water samples are collected from this region. Hardness of water, electrical conductivity, pH these parameters are analyzed in the present work. EDTA complexometric titration method is used to determine temporary and permanent hardness. Comparative study of all samples was done graphically

Key words: Complexometric Titration, Electrical conductivity, pH, Hardness of water

INTRODUCTION

Water is most abundant and most useful compound for living organisms. It plays important part in wide variety of natural processes and is essential for all animals and plant growth¹⁻⁴. Water is basically needed in almost all industries. Water is also used as an energy boiler for chemical plants. As engineering material water is mainly used in boiler and hydroelectric power stations⁵⁻⁶. A large quantity of water is also required in the industries like paper, textile, sugar, chemical, pharmaceutical and ice manufacturing for their routine operations. Industry needs the soft water. If hard water is used in factories, there is possibility of corrosion of machine parts.

Hardness in water characteristics which prevents the 'lathering' of soap. Hardness is due to presence of bicarbonates, chlorides, sulphates, nitrate salt of calcium, magnesium and heavy metal dissolved in water. Hardness of water are of two types. Temporary or bicarbonate hardness is due to presence of bicarbonate salts of Ca^{++}/Mg^{++} . Permanent hardness is due to sulphate, chloride, nitrate salts of Ca^{++}/Mg^{++} .

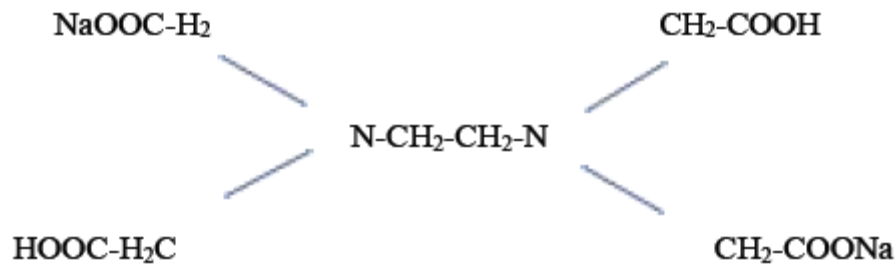
LITERATURE REVIEW

P. Ramaya et al. (2015) : The present study had revealed extreme degrees of hardness in only 4. 16% of samples may not be harmful to humans. Although most people do not like to use solid water, magnesium and calcium have a protective effect on cardiovascular disease, the evidence is that debated and does not prove causality and also the drinking water is the source of calcium and magnesium intake which are essential for the body. Most people have the false idea that solid water is dangerous to health, not solid water, very hard water (high levels of difficulty). So it would be better if we bring awareness among the community.

Aditi Pal (2018) : So from the above experiment in case of intra study it can be concluded that there is a differences in between all the parameter in respect to all the brands and and in the case of research without the magnesium content of the two products all the other brands having different value. Out of all the samples tested majority of them shows moderately hard character and single sample water as soft water character. Also from the experiment calcium and magnesium content has been determined.

EXPERIMENTAL INVESTIGATION

In present work the hardness of water is determined by using EDTA complexometric titration. Ethylene diamine tetra acetic acid and the indicator erichrome black T indicator, both are complexing agents and can form the complex with hardness causing calcium, magnesium ions. The hardness of water can be measured by knowing the volume of EDTA solution required for the titration .



Structure of Disodium salt of EDTA

Chemicals : Following solutions are used in the titration- Standard hard water, erio- chrome black T indicator solution , o.1 M solution of disodium salt of EDTA, buffer solution of pH 10.

Preparation of solutions: Standard hard water- 1 g CaCO_3 was dissolved in 1000 ml standard hard water so that it contains 1mg/ml hardness.

Erio chrome black -T indicator- 1 g Eriochromeblack-T indicator powder was mixed in 100ml ethanol.

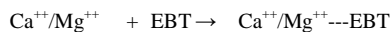
0.1 M disodium salt of EDTA solution- 4 g disodium salt of EDTA dissolved in 1000 ml distilled water.

Buffer solution (10pH)- 67.5 g ammonium chloride was dissolved in 670 ml ammonia solution and volume made up to 1000 ml by addition of distilled water in volumetric flask.

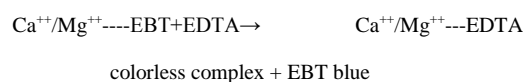
Sampling-for Chemical analysis: the ground water samples are collected from different spots at depth of 0.5 meter in region Subhash Nagar, Wadgaon, District- Yavatmal, in the thoroughly cleaned bottles of 1 lit of capacity provided with cap. All samples were clean and colorless with no turbidity

Procedure for determination of total hardness of water hard water-

10 ml water sample was pipetted out in 250 ml conical flask. 3ml buffer solution and 3 drops of Erio chrome black-T indicator was added to it. Wine red colored solution was observed indicating formation of $\text{Ca}^{++}/\text{Mg}^{++}$ ---EBT complex. Then this solution is titrated with disodium salt of EDTA solution till getting the colour change wine red to blue. This procedure was repeated till getting to constant end point



Hardness causing ions in water indicator
wine red complex



Calculation:

Calculation of strength of EDTA

50 ml std hard water = V_1 ml of EDTA $50 \times 1 \text{ mg of CaCO}_3 = V_1 \text{ ml of EDTA}$

1 ml of EDTA = $50/V_1$ mg of CaCO_3 equivalent

Calculation of total hardness

50 ml given hard water = V_2 ml of EDTA

= $V_2 \times 50/V_1$ mg of CaCO_3

1000 ml given hard water = $1000 \times V_2/V_1$ mg of CaCO_3 equivalent

Total hardness of water = $1000 \times V_2/V_1$ mg/l

= $1000 \times V_2/V_1$ ppm

For determination of electrical conductivity of water samples conductivity meter was used. For

measurement of pH of different samples 15 pH

meter was used.

Table 1: Chemical analysis of few water samples from Subhash Nagar, Wadgaon, District- Yavatmal

Water Sample	pH	Electrical Conductivity	Temporary Hardness (mg/l)	Permanent Hardness (mg/l)	Total Hardness (mg/l)
1	6.56	0.36	180	570	750
2	6.37	0.17	80	520	600
3	6.46	0.18	90	560	650
4	6.33	0.31	90	560	640
5	6.38	0.30	60	490	550
6	6.30	0.25	190	470	660
7	6.24	0.31	40	480	520
8	6.40	0.26	50	550	610
9	5.49	0.30	100	460	560

Variations of pH of water samples at different locations

Variations of EC of water samples at different locations

Variations of Temporary hardness of water samples at different .

Variations of permanent hardness of water samples at different location

CONCLUSION

For the analysis of water, samples were collected from the region ----- Similar solutions were used through out analysis, titrations performed by same person to minimize the experimental errors. From analysis it was observed that the total hardness of water varies. Hardness of sample was found to be higher. According WHO water of hardness upto 400 ppm is safe for drinking

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