

Determination of the Some Chemical Parameters of Tap Water From Monywa University Campus

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Abstract

The main aim of this paper was the monitoring of the quality of water from four sampling sites of tap water in Monywa University campus. The water samples were collected from July (2017) for the determination of temperature, colour, odour, conductivity, pH, hardness, total alkalinity, and total dissolved solids (TDS). The physicochemical properties of water samples such as pH and temperature were determined by using pH meter and thermometer, respectively. Total dissolved solids (TDS), total hardness and total alkalinity values were determined by titrimetric analysis and gravimetric analysis respectively. The physicochemical parameters such as colour, odor, total dissolved solids, total alkalinity content were observed to be higher than the maximum allowable limit of World Health Organization (WHO) Standard Values (2010).

Keywords: Monywa University Campus, water, total hardness, total alkalinity, WHO

Introduction

Water is most abundant in the world except air. Two third of world is made up of water and the rest is land. Water is also the most abundant compound in living cells, which usually contain 65 to 95% of water by weight. Water is needed for the existence of human being, animals and plants. It is estimated that two-third of our human body is made up of water. People use water for many purposes. Therefore, safe and adequate supplies of water are needed for people. Many diseases contain in supplies of water and they can be damaged to human health. It has been estimated that as many as percent of all diseases in the world are associated with unsafe water.

Water is a good solvent and picks up impurities easily. Pure water is tasteless, colourless, odorless and is often called the universal solvent. Minerals which are essential for human can be obtained partially as one way from water. Many scientists have discovered dealing with water all over the world. In Myanmar, most chemists have to analyze water containing them as a responsibility.

It is necessary to know whether the water of Monywa University area contain distinct constituents or not and, is suitable as uses or not. It may be expected to contain characteristic constituents. The analysis of water in the selected area was explored during the departmental research. In the present research work, some physical and chemical parameters of the water samples were thoroughly investigated.

Experimental

Materials, Methods and Instruments

The chemical used were common analytical grade reagent. They were produced from British Drug House (BDH) London and Merck. Qualitative and quantitative elemental analysis could be done by common laboratory apparatus. All analytical determinations, instrumental analyses, and monitoring of the process systems were carried out at the Department of Chemistry, Monywa University.

Sample collection

In this present work, the water samples were collected in July (2017), from four sampling sites of Monywa University Campus, Monywa Township, Monywa District, Sagaing Region. Water sample 1 (S1) was collected in man Chummery, water sample 2 (S2) was collected in woman Chummery, sample 3 (S3) was in PR5 and sample 4 (S4) was also collected in AP Hostel.

Determination of Physicochemical Parameters of Water Samples

The temperature and pH of water samples were determined by thermometer and pH meter. Colour of the samples were recorded by visualization and colourimeter. Odor of the samples were also manualized. Conductivity of the samples were determined by conductivity meter at 28°C. Experimental data was listed in Table 1.

Determination of Total Solids of Water Samples

Procedure

10 ml of filtered water was evaporated to dryness in a heated porcelain crucible (Adoni, 1985). The crucible with residue was put into the oven and dried for 1 hour at 105°C. After this, it was cooled and weighed. These procedure was repeated in three time and mean calculated values was observed. Experimental data was listed in Table 1.

Determination of Total Hardness

The total hardness of water sample was determined by the EDTA titrimetric analysis.

Chemicals

Disodium salt of EDTA (Analar), ammonia (32% w/v), ammonium chloride, calcium carbonate, erichrome black T and sodium chloride from BDH were used.

Preparation of solutions

Ammonia buffer solutions (pH 10): Ammonium chloride (3.5011 g) was dissolved in 28.4 ml of concentrated ammonia solution and the volume was made up to 50 ml in a volumetric flask. These two solutions were mixed thoroughly at pH- 10.

0.0072 M EDTA solution: Disodium salt of EDTA (0.3728 g) was dissolved in distilled water and the volume was made up to 100 ml in a volumetric flask. A 10 ml solution of 0.01 M calcium carbonate was pipetted into a 150 ml conical flask and a tiny amount of the indicator mixture was added. This solution was titrated with (approximately 0.01 M) EDTA solution using a 50 ml burette. The concentration of EDTA solution was found to be 0.0072 M.

0.01 M standard calcium carbonate solution: Calcium carbonate (0.2503 g) was placed in a conical flask and 1:1 hydrochloride acid (w/v) was added to the powder until all of the latter dissolved. Then 50 ml of distilled water was added and boiled for a few minutes to expel CO₂ gas. The solution was cooled, a few drops of methyl red indicator were added and the colour was adjusted to orange with 1:1 hydrochloric acid or concentrated ammonia solution. Then the solution was diluted to 250 ml with distilled water in a volumetric flask. This standard solution (1 ml) is equivalent to 1 mg of CaCO₃.

Eriochrome black T indicator: Eriochrome black T (0.05 g) and 1.0 g of sodium chloride were mixed to obtain a dry powder mixture.

Procedure

A buffer solution (1 ml) was added to 10 ml of sample solution. A small amount of the dry powder indicator was added to this solution. The standard EDTA titrant was added slowly, with continuous string until the last reddish tinge disappeared from the solution; the colour of the solution at the end point was blue. Experimental data are listed in Table 1.

Determination of Total Alkalinity

Total alkalinity of water sample was determined by titrimetric method.

Preparation of solutions

Sulphuric acid solutions (0.02M): About 1M stock sulphuric acid solution was prepared by adding slowly 5.6 mL of the acid to 10 mL of distilled water and the volume made up to 100 mL in a volumetric flask.

The resulting solution (2 mL) was added to distilled water in a 100mL volumetric flask and the volume made up to the mark. This acid solution was standardized with 0.02M standard sodium carbonate solution and methyl orange was used to detect the end point. From the titrant volume, the concentration of sulphuric acid solution (0.02M) was calculated.

Methyl orange indicator solution: Methyl orange (0.05g) was dissolved in distilled water and the volume made up to 100 mL in a volumetric flask.

Procedure

The water sample (10 mL) was pipette into a 150 mL conical flask and 2 drops of phenolphthalein indicator were added. This solution was titrated with 0.0196 M sulphuric acid solution. The end point was reached when the solution just turned colourless from red purple. The reading was noted as 'P' ml of titrant volume used for phenolphthalein alkalinity. Then 2 drops of methyl orange were added and again titrated with the standard sulphuric acid solution until the colour changed from yellow to orange. The total volume of titrant was recorded as 't' and used for both the titrations. Experimental data are list in Table 1 and calculation is described in Appendix II.



Figure 1. Satellite view of sampling sites



Figure 2. Sampling sites of four selected water samples

Results and Discussion

The Results of Physicochemical Properties of Water Samples

The water samples were collected in July (2017), in Monywa University campus and their physicochemical properties were determined. The results were taulated in Table 1.

Table 1. Results of Physicochemical Parameters of Water Sample

No.	Parameters	Sample Result				WHO (2015)
		S 1	S 2	S 3	S 4	
1.	Temperature (°C)	23	24	22	23	<32
2.	pH	8.5	8.5	8.5	8.5	6.5-8.5
3.	Colour	Clear	Clear	Clear	Clear	Clear
4.	Conductivity (µs/cm)	1045	1186	1258	1190	-
5.	Dissolved solid (ppm)	306	450	360	438	<250
6.	Suspended solid (ppm)	30	40	32	30	-
7.	Total hardness (ppm)	67	68	67	67	< 16
8.	Total alkalinity (ppm)	250	220	250	250	30-150

S1 = man chummery, S2= woman chummery, S3= PR5 , S4= AP Hostel

Colour of the samples were clear, it was suggested that low value of particulates. It was different from WHO standard due to the values of total hardness, total alkalinity and high dissolved solid. According to the odor of the sample, it was suggested that sample consist of low organic matter content. From the result of Temperature value (in rainy, the sample < 30°C) the water samples may be presented in high carbonate content and low sulphate content and this value is related to environmental condition. According to the high value of conductivity (at 26°C), the samples consist of high dissolved ions. pH of the collected water samples were within the WHO standards (8.5). The pH values of water vary with geological nature of the sources and the presence of dissolved solids. The alkalinity of collected samples were found to be in the range of (306-450 ppm). Alkalinity shows that the concentration of chloride, carbonate, bicarbonate and hydroxide ions, which makes water alkaline. Alkalinity was highest value in S2 (woman chummery). According to high value of dissolved solid, all samples contain high impurities.

Conclusion

In this research work, four water samples were collected from Monywa University campus in Monywa Township. Physicochemical constituents of water samples were determined. According to pH value, all samples are slightly alkaline. From the results of temperature values of water samples carbonate contents are rich. Total solid, total hardness, values are different from WHO standard (2010) values. So the water from the Monywa University campus may be suitable for multi-purpose but for drinking the samples may be boiled to reduce the hardness.

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