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COMPARATIVE ANALYSIS OF WATER HARDNESS AND PH IN PORT HARCOURT POLYTECHNIC

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Keyword; water, magnesium carbonate, hardness, boreholes etc

Abstracts

The comparative analysis of water hardness and pH of Boreholes in Port Harcourt Polytechnic, Rumuola was carried out from about ten boreholes water in different stations in the school premises. This analysis was done through volumetric analysis and the use of Ex-Tech pH conductivity meter. The mean results obtained from the various stations or locations showed that the water from the various locations is soft and acidic when compared to the standard values of water hardness and pH of World Health Organization (WHO). The result also indicates that the various water sources contains insignificant level of Calcium and Magnesium Carbonates and Sulphates.

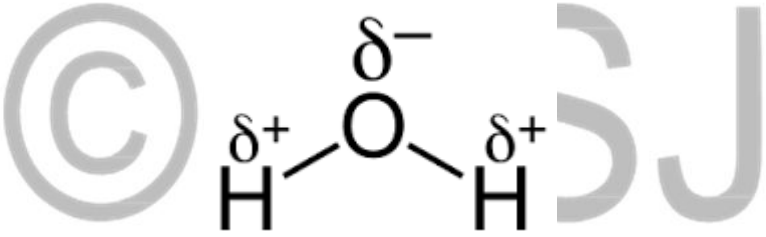
Keyword; water, magnesium carbonate, hardness, boreholes etc.

INTRODUCTION

Water is known as one of the commonest resources in the world, it occupies fifty percent or more of the earth's surface. Water is a universal solvent due to its acessability, affordability and dissolubility of substances because of its polar nature.More than a century ago did people begin to appreciate the existence of water and its economic importance in our environment, However, the history of the earth and water is inseparable. A Biblical Scholar, Bishop, (2004) reported in his research that water was the third thing created by God on earth. Water hardness is due to the presence of magnesium and calcium ions of sulphates and carbonates which are dissolved in form of mineral elements. Some of the advantages of water hardness include development human health due to the absorption of these minerals, building of shells for some environmental organisms for nutrition or research and ornamental purposes. Water p^H determines the level of acid (acidity) and level of alkaline (alkalinity) in the environment.

STRUCTURE OF WATER

The structure of water molecules is polar in nature, that is, one side of the molecule is positive while the other side is negative. Echem (2003).



EXPERIMENTAL

MATERIAL

The materials used are

Conductivity meter, buirrette, ph meter, conical flask, beaker, funnel etc

METHODOLOGY

The method used is titration (volumetric analysis) for the water hardness test.

THE EX-TECH pH CONDUCTIVITY METER

The Ex-Tech pH conductivity was to measure the parameters such as: the salinity of water, pH of water, the temperature of water, Electrical conductivity and Turbidity of water

PROCEDURES FOR THE pH TESTS.

Small quantity of the water sample was poured into a container ($15cm^3$). The probe of the pH meter was rinsed with distilled water and re-rinsed with the water sample. The pH meter was turned on and wailed until it indicates "Self Calibrated". The pH parameter was selected from the meter by pressing the mode. The probe of the meter was immersed into the sample and was not allowed to touch the bottom of the container. The pH value was read after the meter has stopped reading. These steps were used on each of the samples and the values recorded accordingly.

WATER HARDNESS TEST

25ml of the water samples was put into a 100ml conical flask. A 0.1ml of ammonium buffer was added into the sample. A few crystals of Solochrome black was added to the sample which served as an indicator which change the solution to pink colour. The sample was titrated against A 0.01 EDTA solution which change the colour from pink to blue coloration. The volume of the titrant used recorded accordingly.

These procedures was repeated three times (first, second and third titre values) on each of the samples and the average was properly calculated and recorded.

RESULTS

Table 1.0 WATER HARDNESS

Water Sample	Locations	Total Hardness (Mg/l and Ca/l) Titre values				Mean Values
A	Medical Centre	Burette reading (cm^3)	1	2	3	6.72
		Final reading	11.70	10.22	12.28	
		Initial reading	5.00	3.50	5.55	
		Volume of titrant used	6.70	6.72	6.73	
B	Staff Quarters	Burette reading (cm^3)	1	2	3	3.84
		Final reading	4.00	5.74	6.66	
		Initial reading	0.22	1.90	2.80	
		Volume of titrant used	3.78	3.84	3.84	
C	Niger Delta Science School (NDSS)	Burette reading (cm^3)	1	2	3	3.84
		Final reading	5.70	10.74	9.74	
		Initial reading	1.90	6.90	5.95	
		Volume of titrant used	3.80	3.84	3.84	
D	Cambridge A Level Department	Burette reading (cm^3)	1	2	3	3.84
		Final reading	9.15	4.94	4.89	
		Initial reading	5.15	1.10	1.05	
		Volume of titrant used	4.00	3.84	3.84	
E	School of Business & Administrative Studies	Burette reading (cm^3)	1	2	3	3.84
		Final reading	3.85	5.06	5.14	
		Initial reading	0.05	1.25	1.30	
		Volume of titrant used	3.80	3.84	3.84	
F	Staff Canteen	Burette reading (cm^3)	1	2	3	3.84
		Final reading	5.50	5.94	4.99	
		Initial reading	2.25	2.10	1.15	
		Volume of titrant used	3.25	3.84	3.84	
G	Administration Building	Burette reading (cm^3)	1	2	3	3.84
		Final reading	8.85	4.99	4.89	

		Initial reading	5.05	1.15	1.05	
		Volume of titrant used	3.80	3.84	3.84	
H	Business Centre	Burette reading (cm^3)	1	2	3	5.76
		Final reading	8.90	6.96	7.86	
		Initial reading	2.20	1.20	2.10	
		Volume of titrant used	6.70	5.76	5.76	
I	Rectors Quarters	Burette reading (cm^3)	1	2	3	3.84
		Final reading	4.80	3.94	3.89	
		Initial reading	1.00	0.10	0.05	
		Volume of titrant used	3.80	3.84	3.84	
J	School of Humanity and Management Sciences (New Building).	Burette reading (cm^3)	1	2	3	4.32
		Final reading	5.65	6.42	4.37	
		Initial reading	1.15	2.10	0.05	
		Volume of titrant used	4.50	4.32	4.32	

Mean Value = $\frac{2^{nd} + 3^{rd} \text{ Titre values}}{2}$

Table 2.0 WATER pH

Water Sample	Locations	pH Values
A	Medical Centre	4.88
B	Staff Quarters	3.90
C	Niger Delta Science School (NDSS)	3.87
D	Cambridge A Level Department	3.97
E	School of Business & Administrative Studies	4.25
F	Staff Canteen	4.47
G	Administration Building	4.07
H	Business Centre	3.69
I	Rectors Quarters	3.66
J	School of Humanity and Management Sciences (New Building).	3.93

DISCUSSION

From the results on table 1.0 (Water Hardness Test)

A = 6.72Mg/l and Ca/l

B = 3.84Mg/l and Ca/l

C = 3.84Mg/l and Ca/l

D = 3.84Mg/l and Ca/l

E = 3.84Mg/l and Ca/l

F = 3.84Mg/l and Ca/l

G = 3.84Mg/l and Ca/l

H = 5.76Mg/l and Ca/l

I = 3.84Mg/l and Ca/l

J = 4.32Mg/l and Ca/l

But the World Health Organization (WHO) standard range for soft water is from 0-60mg/l and Ca/l. Therefore, the boreholes water is soft.

Hence, none of the values is up to 61 to 120mor 121 to 180 Mg/l and Ca/l which are the WHO standard for temporary and permanent water hardness respectively.

From table 2.0 (the water pH test). The following values was observed.

A = 4.88

B = 3.90

C = 3.87

D = 3.97

E = 4.25

F = 4.47

G = 4.07

H = 3.69

I = 3.66

J = 3.93

But the World Health Organization (WHO) Standard ranges for water pH are as follows

pH of 0 to 4.0 classified as strongly acidic

pH of 5.0 to 6.0 classified as weakly acidic

pH of 6.5 to 8.5 classified as standard range and

pH of 9.0 to 14.0 classified as weakly alkaline

But pH of 7.0 remains the neutral point.

To compare the range to the values gotten from the experiment, it was observed that all the samples of water is strongly acidic, hence, none of the value is closed to the WHO standard range for water pH. That is from 6.5 to 8.5. However, the usage of this type of water as drinking water may increase the risk of acidosis in the body and an irreversible cell damage including lower bone density and immune response. Water with low pH values such as these contains elevated levels of toxic metals hence, it is soft and corrosive. These types of water can leach metals from pipes and fixtures such as Copper, Iron, Lead, Manganese and Zinc. This type of water can also cause aesthetic problems such as a metallic or sour taste.

CONCLUSIONS AND RECOMMENDATION

CONCLUSION

The results show that boreholes water in Port Harcourt Polytechnic is soft due to despite the softness of the water; it still contains traces of industrial, metallic and agricultural pollutants. To balance the pH value of this type of water to a normal pH range (pH of 6.5 to 8.5) there should be need for treatment. This water treatment should be done by the experts in the field such as Water Board or Water Co-operation Agency.

RECOMMENDATION

This research is recommended to Rivers State Ministry of Health and Water resources for further investigations and proper analysis of boreholes in Port Harcourt Polytechnic and its treatment so as to balance the pH of the borehole water.

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