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Analytical study of rain water for the determination of polluted or unpolluted zone

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ABSTRACT

Now a day's pollution increases day by day due to industrialization, population explosion, deforestation, and vehicular exhaust & by using fossils fuels which contains nitrogen, Sulphur, carbon. Out of these three N_2, S does not under goes complete combustion which evolved in to atmosphere so the concentration of oxides of nitrogen, oxide of sulphur increases in atmosphere which cause pollution. Due to pollution climate changes, Global warming and Depletion of ozone takes place. Due to global warming if the temperature of earth increases by one degree then water level in the sea will increase by fifty centimeters which causes adverse effects on human beings. The countries like Netherland, Bangladesh, Maldives, shanghai in china, Mumbai and Goa in India will submerge under the sea water. Due to global warming the rate of evaporation of water from the seas, rivers, ponds will increases and this leads to untimely rains cyclones and hurricanes. Agriculture sector will be badly affected. Due to fast evaporation of surface water there will be a shortage of water for agriculture purposes. A slight increase in the global temperature adversely affects the world food production. Due to acid rain toxic effect to fresh aquatic life, damage to plants leaves, change in rate of photosynthesis in the plants and it also extensive damage to historical structural building, the PH of the soil changes which affect its fertility therefore it is necessary to control pollution and to control the pollution it is necessary to know whether observation zone is polluted or not. In the present work Author proved weather observed zone is polluted or not by simple analysis of rain water by using PH-meter and conductivity meter TDS-Meter by the measurement of PH, Conductivity, TDS of rain water we can predict weather studied zone is polluted or not.

Keywords:-Analysis of rain water, PH, Conductivity, TDS, Prediction of pollution zone or not

1. Introduction

Pollution increases day by day due to industrialization, population explosion, deforestation, and vehicular exhaust and by the burning of fossils fuels which contains nitrogen, Sulphur, carbon. Sulphur, nitrogen, carbon does not under goes complete combustion which evolved in to atmosphere and react with atmospheric oxygen converted in to oxides of nitrogen, oxide of sulphur, oxide of carbon (NOx,SOx,Cox) and increase in the concentration of these gases in the atmosphere which cause pollution. During the raining oxides of nitrogen reacts with rain water and converted in to the nitric acid similarly oxides of Sulphur reacts with $S+O_2 \rightarrow SO_2$, $N_2+O_2 \rightarrow 2NO$;$C+O_2 \rightarrow CO_2$ etc rain water converted in to the sulphuric acid, sulphurous acid and oxides of carbon reacts with rain water converted in to carbonic acid. $SO_2 + H_2O \rightarrow H_2SO_3$, $SO_2 + H_2O + 1/2O_2 \rightarrow H_2SO_4$, $CO_2 + H_2O \rightarrow H_2CO_3$. Pollution causes

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Global warming. As the concentration of these gases in the atmosphere increases the concentration of sulphuric acid, sulphurous acid, Nitric acid and carbonic acid in the rain water increases causing acid rain and PH of rain water decreases from these two parameter i.e. (PH and Conductivity) of rain water, predict weather observation zone is polluted or unpolluted. Due to global warming the rate of evaporation of water from the seas, rivers, ponds will increases this leads to untimely rains, cyclones and hurricanes also the agriculture sector will be badly affected. Due to fast evaporation of surface water there will be a shortage of water for agriculture purposes. Slightly increase in the global temperature adversely affects the world food production. Due to acid rain toxic effect to fresh aquatic life, also causes damage to plants leaves which causes change in rate of photosynthesis in the plants and causes extensive damage to historical structural building. The PH of the soil changes which affect its fertility therefore it is necessary to control pollution to know whether observation zone is polluted or not.

It is determined by simple analysis of rain water by using PH-meter and conductivity meter, TDS-Meter by the measurement of PH, Conductivity, and TDS of rain water. We can predict weather studied zone is polluted or not .Author collected the rain water from Dhamangaon railway Amravati district Maharashtra, India. And measure rain fall in the month of 8 July 2010.to 28 July 2010.

2. Materials and Method

2.1 Determination of PH of Rain Water

To find out pH of rain water the following procedure is subsequently adopted. 1) Switch on the instrument and allow it to warm up for some time.2) Prepare the buffer solution of known pH by dissolving the buffer tablets in specific volume of distilled water. These are necessary for calibrating of instrument.3) Adjust the temperature Knob according to the temperature of solution under study .4) Insert the electrode assembly into the buffer solution and carefully adjust the system knob until the meter reading coincides with the known pH of the selected buffer solution.5) Withdraw the electrode assembly and wash it by distilled water and then insert in a beaker containing the second buffer solution, adjust the slope control to achieve the same. Now, withdraw the electrode assembly and wash it with distilled water then deep it in beaker and introduce into a test solution taken in another small beaker. Take reading the pH of the unknown solution from the pH Meter. Remove the electrode assembly. Rinse in a distilled water and placed it in a beaker containing another rain water of unknown pH and record pH of rain water.

2.1 Determination of PH of Rain Water

In calibration mode standard solution temperature range should be in between 5^0C to 45^0C. Calibration not required frequently once it is done. The standard potassium chloride solution conductivity is known at different temperature. This calibration method is preferable.1) Select conductivity mode.2) after thoroughly cleaning, immerse the cell in the standard solution, say 0.1412 (=14.12ms/cm to 15.12 ms/cm) at 30^0C to 40^0C.3) Select 20ms/cm range.4) Set conductivity (as pre temperature) using cell constant POT and then lock using lock nut.5) Take rain water sample then measure the conductivity of rain water record the conductivity of rain water.

2.2 Determination of TDS of Rain Water

In the determination of TDS of rain water, TDS Meter is used. Wash the electrode of TDS Meter with the help of distilled water then take test solution rain water, deep the electrode of TDS meter and note down the readings.

Table 1: Table showing PH, Conductivity, TDS and rain fall of rain water

Date of Rain Fall	Rain Fall In mm	P^H	Conductivity	TDS (ppm)
08/07/2010	2.8mm	5.08	0.7 MS/cm	26
09/07/2010	5.8mm	5.43	0.1 MS/cm	07
12/07/2010	4mm	6.72	0.1 MS/cm	19
13/07/2010	3.7mm	6.27	0.2 MS/cm	24
15/07/2010	2.8mm	6.3	0.1 MS/cm	23
16/07/2010	1.6mm	6.3	0.1 MS/cm	32
18/07/2010	3.0mm	6.7	0.1 MS/cm	15
21/07/2010	3.7mm	7.3	0.1 MS/cm	13
22/07/2010	15mm	7.5	00 MS/cm	04
24/07/2010	34mm	7.22	00 MS/cm	03

2.3 Determination of Hardness of Rain Water

Pipette out 10 ml of water sample (rain water) in a conical flask adds one ml of buffer solution and two drop of Erie-chrome black-T indicator and titrate this solution with 0.01 M EDTA solutions from the burette until color changes from wine red to clear blue note down the titer value. Repeat this procedure and find out the constant reading from titer value which corresponds to total hardness of water. Measure out 250 ml of rain water sample in 500 ml of beaker, boil gently for sixty minute till volume reduces up to the 50 ml. then filter the water sample into 250 ml volumetric flask and make up the volume of water up to the mark with addition of distilled water.

Then pipette out 10 ml sample solution from a volumetric flask into a conical flask, add one ml buffer solution and one to two drops of Erie-chrome black T indicator titrate this solution with standard EDTA solution until the color changes from wine red to blue note down the titer value. Repeat the procedure and note down the titer value. Find out the constant reading from the titer value, which corresponds to permanent hardness of water. Temporary hardness of water = [(Total hardness of water) – (Permanent hardness of water)].

Table 2: Table showing temporary, permanent, total hardness of water

Sr .No.	Temporary hardness of water	Permanent hardness of water	Total hardness of water
Sample No.1	15 ppm.	15 ppm.	30 ppm.
Sample No.2	10 ppm.	10 ppm.	20 ppm.
Sample No.3	10 ppm.	10 ppm.	20 ppm.

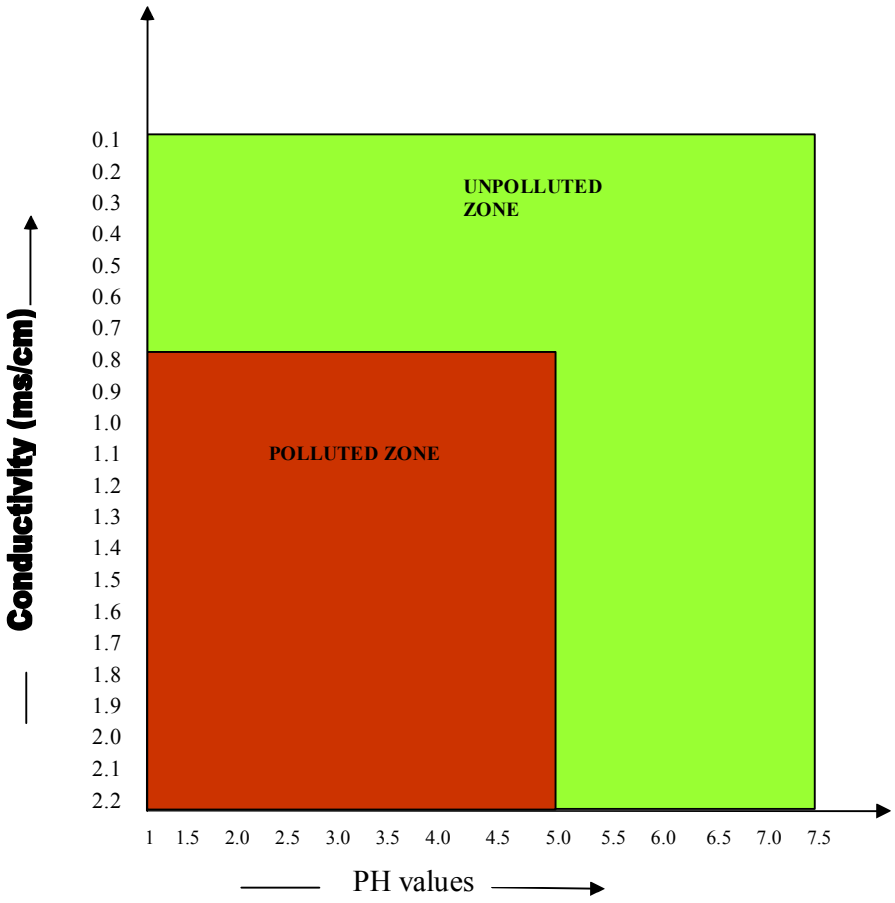

Figure 1: Image showing air polluted zone or unpolluted zone

3. Results

From the graph it is clears that observation zone having PH in between 5.08 to 7.5 and conductivity in between 0 to 0.7 MS/cm is unpolluted. If the observation zone having PH in between 5.0 to 1 and conductivity is greater than 0.8 MS/cm is polluted zone. This can generalized and can be used in any zone for determination of polluted or unpolluted zone.

4. Discussions

From the PH of rain water it is acidic then acidic nature of rain water due to presence of oxides of carbon, oxides of nitrogen, and oxides of sulphure in the atmosphere. As the concentration of these gases in the atmosphere increases the PH of rain water decrease due increase in quantity of nitric acid, sulphuric acid, Sulphurous acid and carbonic acid in the rain water but there is no effect of on its hardness .From the TDS of rain water it clears that more is the TDS of water due to more suspended and dust particles in it.TDS of rain water also depends upon quantity of rain fall. From conductivity of rain water it is clear that conductivity of water due to presence of cat ions, anions and rain water is pure water pure water also undergo dissociation in which ,$H3O^{+}$,OH^{-} ions presents in small quantity it shows little conductivity. From the PH and conductivity of rain water we can predict weather studied zone is polluted or not. If PH of rain water in between 1-5 and conductivity is greater than 0.8 then studied zone is polluted but if PH in between 5.5-7.5 and TDS less than 50ppm,

then studied zone is unpolluted zone. By performing this simple experiment we predict weather that zone is polluted or not.TDS of rain water increase if dust particle, suspended particle in the atmosphere increase and PH of rain water is inversely proportional to oxides of carbon, oxides of nitrogen, oxide of sulphure of the atmosphere.

5. References

1. Ozcan H, "Monitoring and evaluation of the spatial temporal changes of PH, SPCOND, DO, ORP and TDS in the waters of Troia (turkey) by GIS", J Gottinger Geographische Abhandlungen. 133, pp 175-183.

2. Turekan O., Sermin O., (2005). "Elemental Composition of Rainwater in Mersin an urban site in the North Eastern Mediterranean" Proceeding (AQM), pp 20-29.

3. Senanayake N., Perera M.T.M.D.R., Weragoda M., (2005). "Acid rains and rains causing acidity of soils in Sri Lanka", Proceeding (AQM), pp 30-37.

4. Jin-Jun W., Jian-Pian Z., Lin H., Zhi-Mo Z., (2006). "Influence of long-term exposure to simulated acid rain on development, reproduction and acaricide susceptibility of the carmine spider mite, Tetranychus cinnabarinusr", J insect science, pp1-8.

5. Menz C., Seip M., (2000). "Acid rain in Europe and the United States: an update" J Environmental Science & Policy: 7, pp 253-265.

6. Stinner H., Stinner R., McCartney A., (1988). "Effects of simulated acidic precipitation on plant—insect interactions in agricultural systems: corn and black cutworm larvae", J Environmental Quality 17, pp 271-376.

7. Zhang P., Wang J., Zhao M., Dou W., Chen Y., (2004). "Effects of simulated acid rain on the physiology of carmine spider mite, Tetranychus cinnabarinus (Boisduvals) (Acari: Tetranychidae)" J Applied Entomology 128, pp 342-347.

8. Walton E., Camptom M., Allan D., Daniels D., (1982). "The effect of acid stress on survivorship and reproduction of Daphnia pulex (Crustacea: Cladocera)" J Canadian j zoology 60(2), pp 573-579.

9. The American Ground Water Trust. (2003). "Acid Rain and Ground water PH (THE AMERICAN WELL OWNER)", J Number 3.

10. Leslie J., (2000). "What happen when the world no longer has enough freshwater? Running Dry" J Harper's magazine, pp 2000.

11. Greller M., Locke C., Kilanowski V., and Lotowycz E., (1990). "Changes in Vegetation Composition and Soil Acidity Between 1922 and 1985 at a site on the North Shore of Long Island", J New York Bulletin of the Torrey Botanical Club 117(1), pp 450-458.

12. Hoffman J., Pichard L., Mass L., (1986). "Irrigation water quality Options for Corn on saline Organic solids", J Irrigation science 7(1), pp 265-275.

13. Hendershot W.H., Lalande H., Duquette M., (1993). "Soil Sampling and Methods of Analysis", J CRC Press, Chapter 16.

14. Jordan J., Patterson A., Windisch G., (2003). "Conceptual ecological models for the Long Island pitch Pine Barrens: implications for managing rare plant communities", J Forest Ecology and Management, 185, pp 151–168.