A STUDY OF GEOCHEMICAL EFFECT ON THE PHYSICO-CHEMICAL PROPERTIES OF DIFFERENT SOURCES OF WATER IN NAGPUR MUNICIPAL AREA OF MAHARASHTRA

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ABSTRACT

Various types of ions are present in the underground of earth. These ions have major role to maintain the quality of ground water. Mostly chlorides, fluoride, carbonate, bicarbonate, nitrate and phosphate anions are present. Cations like Ca^{2+}, Mg^{2+}, Na^+ and K^+ and anions like Ci^-, F^- are present in the underground water of the earth Both cations and anions present in the earth are equally responsible to maintain the quality of water. In the present investigation, three different water sources samples of Nagpur area were collected and various chemical parameters were studied.

Key words: Ground water, Lake water, Well water, Bore water.

INTRODUCTION

Rain is the prime source of all water. A part of the rain water sinks into the ground to form ground water. Rain water percolating into the ground and reaching permeable layer in the zone of saturation constitutes ground water source. The water as it sleeps down, comes in contact with organic and inorganic substances during its passage through the ground and acquires chemical characteristics. Underground water shows changes in the various chemical parameters as compared to the surface water. For this, three different water sources of same Nagpur Municipal area were collected and analyzed.

EXPERIMENTAL

The water samples were collected from the Nagpur Municipal area. These are bored

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water (Tube well), well water and lake water and are considered as sample I, sample II and sample III, respectively.

The chloride, fluoride, hardness, DO, pH and conductivity of all these water samples were determined.

The presence of chloride ions was determined by titrating water samples with standard $AgNO_3$ solution using K_2CrO_4 as indicator.

The presence of fluoride ions was determined by ion selective electrode method.

pH of all the three water samples was determined by pH meter. It was standardized by buffer solution of pH 4.0 and pH 9.2.

The total hardness of all these three water samples were determined by complexometric titration with EDTA and EBT indicator.

The dissolved oxygen (DO) content in the water samples was determined by titrating with standard sodium thiosulphate using starchas indicator.

Conductivity of all these water samples was recorded by using conductometer. Conductivity cell having known cell constant was used.

RESULTS AND DISCUSSION

Chlorides occur naturally in all types of water. In given water samples, well water contains 139.9 mg/L, which is minimum and bore water contains 219.93 mg/L, which is slightly high. Lake water has intermediate value i.e. 179.94 mg/L. If the chloride concentration reaches beyond 250 mg/L, the water become salty.

Fluoride contents in the water samples was found very less in lake water i.e. 0.29 mg/L but high in the bore water i.e. 1.35 mg/L. Fluoride is beneficial for human health, if it taken in controlled quantity. It causes dental and skeletal fluorosis, when the concentration is high. Fluoride may give rise to mild dental fluorosis at drinking water concentration between 0.9 and 1.2 mg/L. From the above observation, it is clear that lake water is most suitable for drinking purposes.

pH of the water is a measure of the acid-base equilibrium. It has major importance in determining the corrosivity of water. The lower is the pH, higher is the level of corrosion.

In the observations, it was found that pH values measured for all three samples were in the pH range 7.2 to 7.7. This shows that pH of water samples are slightly alkaline and are suitable for drinking purposes.

Hardness is the property of water, which prevents the lather formation with soap. In the present investigation, it was found that total hardness in lake water was 150 mg/L while in bore water, it was 430 mg/L. Bore water is very deep and therefore, more numbers of ions are dissolved to give hardness to the water. Hardness is due to presence of high contents of calcium and magnesium salts in the water.

Lake water, due to its low hardness, is more suitable for drinking purposes.

Table 1: Physico-chemical parameters of water samples

Water sample	Chloride	Fluoride	pH	Hardness	D.O.	Conductivity
Sample-I	219.93 mg/L	1.85 mg/L	7.6	430 mg/L	4.5 m/L	0.90
Sample-II	139.95 mg/ L	1.78 mg/L	7.2	420 mg/ L	5.6 m/L	1.2
Sample-III	179.94 mg/ L	0.29 mg/L	7.7	150 mg/ L	6.7 m/L	0.4

Dissolved oxygen is one of the most important parameter. It is essential to maintain the higher forms of biological life in the water. Low dissolved oxygen is generally associated with heavy contamination by organic matter.

Lake water contains 6.7 mg/L of DO, while bore water contains less i.e. 4.5 mg/L. Hence, lake water is more suitable for all purposes for human being.

Conductivity of lake water was found less i.e. 0.424 mS/cm while conductivity of well-water sample was found to be 1.239 mS/cm. These values indicate that lake water is less contaminated by ions than well water and bore water.

CONCLUSIONS

From these results and discussion, it is concluded that in the same Nagpur Municipal area, when three different water sources were analyzed, out of these, the lake water, which is open to air, was found more suitable for human being for all purposes. Bore water and well

water contains more hardness and slight higher value of fluorides, which makes this water not suitable for drinking and other purposes. High conductivity indicates that more salts are presents. This is due to the underground salts getting dissolved in well water and bore water. Therefore, it is recommended that lake water should be used for drinking and all other purposes.

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