

Determination of Heavy Metals in Ground Water of Raigarh District (C.G.)

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Abstract – The quality of water is important consideration is suggest criteria of purity of water. Water Quality is one of the most important concerns. Quality of water is an important criterion for evaluating the suitability of water for drinking and irrigation. Metal contamination in water is a major component in the determination of water quality. The heavy metals levels up to ppb levels in drinking water quality may cause savior health problems and also cause cancer. In this study, we made an attempt to know the concentration of six heavy metals in ground water in different locations of Raigarh District up to ppb levels. For this study, 4 groundwater samples were collected in April 2017 and preserved by addisamplesbdrops of nitric acid. These samples were subjected to analysis for four elements like Cd, Pb, Cu, Zn and Fe by using Atomic Absorption Spectroscopy (AAS) (Laniyan et al.). The concentrations of these metals in the study area were compared with drinking water quality limits are given by the World Health Organization (WHO), 4th edition in 2011.

Keywords- Heavy Metals; WHO Limits, atomic adsorption Spectroscopy (AAS), Ground Water Raigarh district (C.G.)

I. INTRODUCTION

"As we know health is wealth" for a good health human has dependent clean and neet food water and clean environment also, But in ground water contamination with metal as large amount is most unlike issue of toxic nature of environment .Small of ammont of these element is commn for diet and vary nessecery for good human health.

The heavy metals are antimony, arsenic, bismuth, cadmium, cerium, chromium, cobalt, copper, gallium, gold, iron, lead, manganese, mercury, nickel, platinum, silver, tellurium, thallium, tin, uranium, vanadium, and zinc. [Momodu and Anyakora (2010)]. The insertion of these heavy metal via food ,air, adsorption through the human skin in industrial or agricultural activities. The excess of any heavy metals has effect directly or indirectly to human bodies.

Several disease like cancer ,nerve system damage, skin disease, less growth and many of cases of death caused by including unnecessary ammount of heavy metal in ground water. (Han et al., 2006; Salamatinia et al., 2008). Heavy metal are metallic elements with high atomic weight and density.

These include the transition metals, some metalloids, lanthanides and actinides. Amounting to more than 20 metals generally exist in a positively charged form and can bind on to negatively-charged organic molecules. Being metals ions, heavy metal cannot be degraded or

destroyed, therefore their stability make them as the persistent toxic substances in environment. Heavy metal as the environmental contaminants can be found in the air, soil and water, which pose health hazard to the general public .

Many studies are investigated by monitoring of heavy metals in ground water of Raigarh C.G. distict has assessed groundwater contamination with heavy metals (Pb, Cu, Zn and Cd) and results showed in various locations of water samples. Laniyan et al. were also investigated the occurrence of heavy metals in groundwater .

II. MATERIAL AND METHODS

1. Sampling and Preservation

The water sample are subjected form four various location of Raigarh C.G. district .For analysis the water sample were taken in 250ml plastic bottles. For the preservation some drop of nitric acid added on water samples.

To analysis different method are used for pH entimation by pH metric titration, for Ca and Mg hardness evolution EDTA titration method is applied used.

Systolic Atomic Absorption Spectrophotometer is used to analyze the concentration of metal ions. The calibration curves were constructed using standard solution of the metal ions by following the procedure

given in the manual using appropriate detectors in the wavelength range suitable for the concentration range. Six replicates of each experiment are carried out.

III. RESULTS AND DISCUSSION

1. Conductivity

Conductivity is a measure of the ability of water or solution to carry an electrical current. Conductivity in water is affected by the presence of inorganic dissolved solids. Organic compounds do not conduct electrical current very well and therefore have a low conductivity when in water.

Conductivity is also affected by temperature, the warmer the water, the higher the conductivity. For this reason, conductivity is reported as conductivity at 25 degrees Celsius. Conductivity in streams and rivers is affected primarily by the geology of the area through which the water flows.

Discharges to streams can change the conductivity depending on their make-up. Conductivity is measured in micro Siemens per centimeter ($\mu\text{s}/\text{cm}$).

2. Total Dissolved Solids

Total Dissolved Solid represents the total concentration of dissolved substances in water. The degree to which these dissociate into ions, the amount of electrical charge on each ion, ion mobility and the temperature of the solution all have an influence on conductivity.

Total dissolved solids (in mg/l) may be obtained by multiplying the conductance by a factor which is commonly between 0.55 and 0.75. This factor is determined for each water body, but remains approximately constant provided the ionic proportions of the water body remain stable.

The multiplication factor is close to 0.67 for waters in which sodium and chloride dominate, and higher for waters containing high concentrations of sulphate (WHO, 1996).

3. Turbidity

Turbidity is the cloudiness or haziness of a fluid caused by individual particles (suspended solids). Turbidity in open water may be caused by growth of phytoplankton, human activities which lead to high sediment levels entering water bodies during rain storms (USEPA, 2005).

4. Colour, Odor and Taste

Physically, the color of water is affected by factors like the light source, absorption and scattering of light, as well as suspended materials in the water. Quality drinking water should be colorless (WHO, 2008) Color and turbidity determines the depth to which light penetrates in water systems.

Odors and tastes in water are associated with the presence of variety of substances which include living microscopic organisms or decaying matter. Taste responses are often difficult to differentiate from odor responses because the senses of taste and smell are closely interrelated. Odors can be caused by volatile substances in concentrations too small to be detected by ordinary analytical techniques.

5. Chemical Indicators of water Quality Ph

The pH value of a water source is a measure of its acidity or alkalinity. It is a measurement of the activity of the hydrogen atom, because the hydrogen activity is a good representation of the acidity or alkalinity of water.

For drinking water, the WHO guidelines set the pH in the range of 6.5-8.5 (WHO, 2008). Human activities like industrial operations and toxic waste disposal have effect on the pH of water sources.

A change in the pH of water can have consequences on aquatic life which are extremely sensitive to changes in water temperature and composition.

6. Hardness

Water hardness is determined by the concentration of multivalent cations in the water. Common cations found in hard water include Ca^{2+} and Mg^{2+} . These ions enter water supply by leaching from minerals within an aquifer.

Hardness is most commonly expressed as mg/l of CaCO_3 . The following equilibrium reaction describes the dissolving or formation of calcium carbonate scales:



–Calcium carbonate scales formed in water-heating systems are called lime scale.

Temporary hardness of water is caused by the presence of dissolved bicarbonate minerals (calcium bicarbonate and magnesium bicarbonate). When dissolved, these minerals yield calcium and magnesium cations (Ca^{2+} , Mg^{2+}) and carbonate and bicarbonate anions. The presence of the metal cations makes the water hard.

However, unlike the permanent hardness caused by sulphate and chloride compounds, this "temporary" hardness can be reduced either by boiling the water, or by the addition of lime (calcium hydroxide) through the process of lime softening. Boiling promotes the formation of carbonate from the bicarbonate and precipitates calcium carbonate out of solution, leaving water soft.

Permanent hardness cannot be removed by boiling. Despite the name permanent, the hardness of the water can be easily removed using an ion exchange column.

7. Sulphates

Sulphates occur naturally in drinking water. They have a detoxifying effect on the liver and stimulate the function of the gall bladder and thus aid the digestive function as well. In high doses, they have a laxative effect. Health concerns regarding sulphate in drinking water have been diarrhea which may be associated with the ingestion of water containing high sulphate levels. Sulphate in drinking water has a secondary maximum contaminant level of 250 milligrams per liter (mg/L), based on aesthetic effects (i.e., taste and odor).

The presence of sulphate in drinking-water may also cause noticeable taste and may contribute to the corrosion of distribution systems.(WHO,2008; USEPA, 2012).

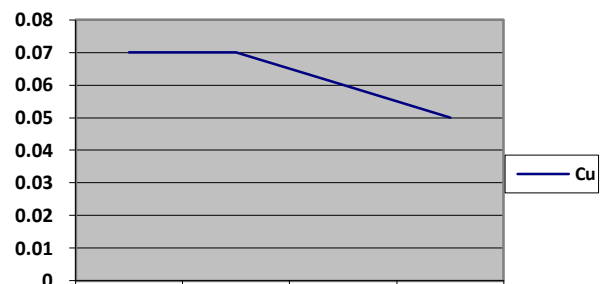
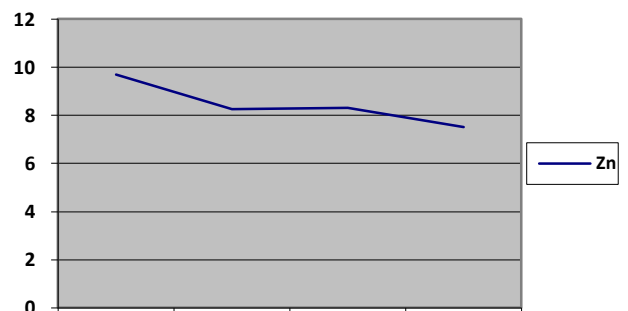
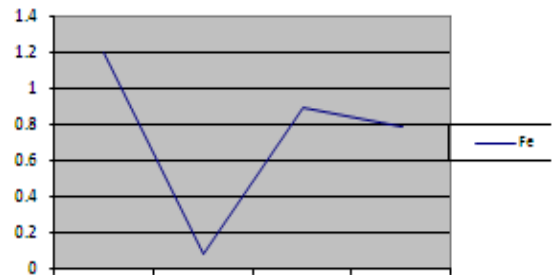
Table1. Indian standards & who guidelines for drinking water.

S.No	Parameters	Bis,Indian Standards (Is10500:1991)		World Health Organization (Who Guideline)
		desirable limit	permissible limit	
1.	Turbidity(NTU)	5.0	10	5.0
2.	Total Hardness(As CaCO_3)(Mg/L)	300	600	500
3.	Dissolved Solids(Mg/L)	500	2000	1000
4.	Sulphate(Mg/L)	200	400	400
5.	Cadmium(Cd) (Mg/L)	0.01	No relaxation	0.005
6.	Iron(Fe) (Mg/L)	0.3	1.5	0.3
7.	Zinc(Zn) (Mg/L)	5.0	15	5.0
8.	Copper (Cu) (Mg/L)	1.0	1.5	1.0

Table2.Determination of Heavy Metal Underground Water in Raigarh Districts C.G.

S.NO.	Heavy metal in mg/L	Raigarh (S1)	Pussore (S2)	Kodatarai (S3)	Bonda (4)
1.	Cd	0.009	0.003	0.005	0.004
2.	Fe	1.20	0.08	0.89	0.79
3.	Zn	9.70	8.25	8.31	7.50
4.	Cu	0.07	0.07	0.06	0.05

Graph



IV.CONCLUSION

The study of various location of ground water samples of Raigarh C.G. district was found the important parameters namely temperature, pH, total dissolved solid, alkalinity,hardness and chloride. The comparative study of the ground water samples, no samples have crossed the maximum level of permissible parameters. The experimental investigation as in results the various locations ground water samples are suitable for uses water quality for various purposes.

ACKNOWLEDGEMENT

The authors are thankful to Dr. Jayati Mitra HOD Chemistry Dr.C.V.Raman University Bilaspur (Kota) C.G.

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