Journal of Pharmaceutical and Scientific Innovation
www.jpsionline.com
Research Article

ANALYSIS OF HEAVY METALS IN THE VICINITY OF JINDAL FERRO ALLOYS CORPORATION, VISAKHAPATNAM, A.P., INDIA

A.V.L.N.S.H.Hariharan*, D.Murali Krishna and G. Sreenivasa rao
*Department of Chemistry, GITAM Institute of Technology, Gitam University, Visakhapatnam – 530 045 India

Received on: 19/12/11 Revised on: 18/01/12 Accepted on: 22/01/12

ABSTRACT
Water pollution is caused by industries as well as other activities etc. Research findings indicate that application of heavy doses pollute ground water through leaching of nitrate from fertilizers and metals like cadmium from single superphosphate and of fluoride from phosphate rocks. Heavy metals such as lead, mercury, arsenic, aluminum, copper, nickel, tin and antimony deteriorate water quality to a large extent. This paper deals with the analysis of heavy metals- Cu, Cr, Fe Mn and Zn in surface and ground waters for a period of 6 months from eight sampling stations in the vicinity of Jindal Ferro Alloys corporation , Visakhapatnam Dt.(A.P.) The estimated metal levels in the water samples were compared with those limits laid down by WHO standards. It was found that concentration of some metals such as Fe and Cr above the permissible levels in summer probably due to seasonal variation.
Key words: Heavy metals –Pollution- Jindal ferroalloys -Visakhapatnam Dt.

INTRODUCTION

Metals such as arsenic, chromium, copper, nickel, tin, antimony, bismuth, lead, mercury, and vanadium are toxic beyond certain level. Most organic substances are degradable by natural processes. Toxic metals replace nutrient minerals in enzyme binding sites. When this occurs, the metals inhibit, over stimulate or otherwise alter thousands of enzymes. An affected enzyme may contribute to many health conditions. Toxic metals may also replace other substances in other tissue structures. These tissues, such as the arteries, joints, bones and muscles, are weakened by the replacement process[1,2]. They may also support development of fungal, bacterial and viral infections that are difficult or impossible to eradicate until this cause is removed. In view of the above, it is proposed to carry out the analysis of metals in water samples in Jindal Ferro Alloys Corporation, Visakhapatnam Dt....

MATERIALS AND METHODS

Water samples collected from eight sampling stations selected for the analysis were given bellow. : S_1& S_2 – Jindal nagar (Bore Well& well water), S_3 -Temple street (Bore Well) S_4 –Opp. to School (Bore Well), S_5 & S_6–Rayaparaj peta (Bore well& well water), S_7 –Main road (Bore Well) and S_8 – Bridge area (Bore Well), The samples collected in 1lt. sterilized bottles were preserved with 2 mL nitric acid to prevent the precipitation of metals They were then concentrated and subjected to nitric acid digestion. The samples were analyzed on 13th of each month during May 2011 to Oct 2011. All the chemicals and reagents used were of analytical grade. D.D water was used for the preparation of solutions. Heavy metal analyses were carried out using Atomic absorption spectrophotometer. The pH of water samples was determined by a pH-meter and conductivity was measured by a digital conductivity meter (Systronics). The results obtained were compared with WHO [3] and Indian standards[4] for drinking water.

RESULTS AND DISCUSSION

The results obtained on the analysis of heavy metal concentration at different stations are
Summarized in Tables – 1 to 6.
P^H is an important factor in water analysis as it enters in to calculations of acidity alkalinity etc. It is known that pH of water (6.5 to 8.5) does not has no direct effect on health. Acid base reactions are important in ground water because of their influence on pH and the ion chemistry. Higher levels of pH and alkalinity tend to reduce toxicity of metals in water . pH the water samples in the present study found in the range 7.25- 8.25 which are well within the safe limit[4].

Chromium (Cr)

Both the forms Cr(VI) and Cr(III) are biologically important. Cr(VI) is more toxic than Cr(III).Trivalent chromium is found to be essential to human beings and animals .It plays vital role in insulin metabolism as the glucose tolerance factor(GTF). Cr(VI) is responsible for chrome ulcer and kidney damage[5,6]. The maximum concentration of Cr(VI) permitted in domestic water supplies is 0.05 ppm. Other sources of contamination of chromium in the environment are Chlor-alkali, electroplating , leather textiles, pigments, dyes, metal finishing, mining and metallurgical industries. The ash from thermal plants of burning of coal as fuel in various industries contain significant amount or Cr which seeps through earth and affects the fertility of land. Cr content of the present varied between BDL to 0.072mg/lt.

Copper(Cu)

Since copper is both essential and potentially toxic element, there may be risks to living being if there is too little or too much of copper in the environment .Large doses of copper irritate stomach[7]. When present in excess limit(>1.0mg/lt) imparts undesirable taste to drinking water. The values obtained (BDL to 0.065mg/lt) are within the permissible limits[4].

Iron(Fe)

Iron deficiency is quite common among people throughout the world. However iron exposure results in mottling of lungs[1]. Standards of iron in drinking water is 0.3mg/lt. In the present study iron content varies between BDL to 0.34 mg/lt.. The Fe concentration of water is slightly exceeding the drinking water limit of 0.3 mg/L 3. Long term consumption of drinking water with high concentration of iron may lead to liver diseases[8] .

Manganese (Mn)

It is one of the most important trace elements essential for organisms. Shortage of Mn causes fatness, Glucose intolerance. Manganese effects occur mainly in the respiratory tract and in the brains[9]. It can also cause Parkinson and lung embolism. Chronic Mn poisoning may result from prolonged inhalation of dust and fume. The

central nervous system is the chief site of damage from the disease, which may result in permanent disability. Symptoms include languor, sleepiness, weakness, emotional disturbances, recurring leg cramps, and paralysis[10]. Mn is found to vary between BDL and 0.078 mg/lt.

Zinc(Zn)

Drinking water also contains certain amounts of zinc, which may be higher when it is stored in metal tanks. Industrial sources or toxic waste sites may cause the zinc amounts in to reach levels that can cause health problems[11]. More than 50% of metallic zinc goes into galvanizing steel, but is also important in the preparation of certain alloys. It is used for the negative plates in some electric batteries and for roofing and gutters in building construction. . The low concentration of zinc in drinking water could be due to the fact that pH of water samples were slightly alkaline and its solubility is a function of decreasing PH. In the present study Zn content varies between BDL to 0.072 mg/lt. Low intake of zinc results in growth retardation, immaturity and anemia.

ACKOWLEDGMENT

Thanks are also due to Principal, GIT and Management of GITAM University for providing necessary facilities.

REFERENCES

1 Lokhande R S and Kelker N Ind J of Env.Prot.1999 ,19:664.
2 Petrus R and Warchol J K Water.Res 2005,39;819-830
3. WHO, Guidelines for drinking water quality, Geneva, 1984.
4. ISI Indian standard institution, Indian standards for specifications for drinking water,1983.
5 Verma N K, Jain O P and Srivatsava P K Proc.Acad. Env.Biol.1995,4(1):123
6 Hariharan A VLNSH. J. Chem. Pharm. Res., 2011, 3(3): 93.
7. Bruins M R, Kapil S and Oehme F W, Ecotox Environ Safe, 2000, 45**:** 198.
8. Sullivan J L 1989. Amer Heart J; 1177-1187, 117
9 Barik R N ,Pradhan B and Patil R N J.Ind.poll.control 2005,21(2):355-362.
10. Raje G B ,Muley D V and Manker D D J.Ind.poll.control 2003,21(2):381
11 National research council drinking water and public health Washington 1977 .

Table –1: Physico – Chemical Parameters of Water Samples Collected on 13-5-2011

Station No.	Temperature (^{0}C)	pH	Cr	Cu	Fe	Mn	Zn
S1	28.13	7.72	0.032	0.065	0.12	0.055	0.028
S2	27.35	7.79	0.056	0.032	BDL	0.018	0.027
S3	28.08	7.83	0.034	0.043	0.016	0.082	0.072
S4	27.80	7.94	0.019	0.021	0.032	BDL	0.019
S5	27.92	7.65	BDL	0.022	0.019	0.045	0.032
S6	27.32	7.62	BDL	BDL	0.039	BDL	BDL
S7	27.89	8.12	0.036	0.019	0.27	0.032	0.050
S8	27.74	8.25	BDL	BDL	BDL	BDL	BDL

Table –2: Physico – Chemical Parameters of Water Samples Collected on 13-6-2011

Station No.	Temperature (^{0}C)	pH	Cr	Cu	Fe	Mn	Zn
S1	28.05	7.36	0.012	BDL	0.037	BDL	0.006
S2	26.90	7.44	0.035	0.051	0.045	0.022	0.035
S3	28.03	7.81	0.044	BDL	0.050	BDL	0.028
S4	27.84	7.70	0.019	0.023	BDL	0.26	0.014
S5	28.32	7.81	BDL	BDL	0.035	0.038	BDL
S6	27.23	7.64	BDL	0.058	0.021	0.027	BDL
S7	27.82	8.05	0.043	BDL	0.052	0.050	0.016
S8	27.44	8.14	BDL	0.027	BDL	0.032	0.022

BDL = Below Detectable Limit

Table –3: Physico – Chemical Parameters of Water Samples Collected on 13-7-2011

Station No.	Temperature (^{0}C)	pH	Cr	Cu	Fe	Mn	Zn
S1	27.08	7.93	0.045	BDL	0.05	BDL	0.015
S2	27.5	7.28	BDL	0.027	0.02	BDL	BDL
S3	27.63	7.84	0.008	0.045	BDL	0.022	0.046
S4	27.81	7.51	0.029	BDL	0.31	0.043	BDL
S5	26.98	7.61	0.038	0.033	BDL	0.052	0.032
S6	27.53	8.24	BDL	0.048	0.042	BDL	BDL
S7	28.25	8.21	0.026	BDL	0.19	0.046	0.037
S8	27.75	8.05	0.037	0.047	BDL	0.033	BDL

.

Table –4: **Physico – Chemical Parameters of Water Samples Collected on 14-8-2011**

Station No.	Temperature (^{0}C)	pH	Cr	Cu	Fe	Mn	Zn
S1	27.83	7.66	0.032	0.04	0.025	0.015	0.021
S2	27.34	7.25	0.056	0.026	BDL	0.046	0.025
S3	28.10	7.80	0.034	0.06	0.052	0.028	BDL
S4	27.68	7.73	0.019	0.021	0.24	0.045	0.014
S5	28.16	7.54	BDL	0.037	BDL	0.020	0.062
S6	27.53	7.64	BDL	BDL	0.21	BDL	BDL
S7	27.53	8.20	0.036	0.019	0.039	0.037	0.045
S8	26.80	7.83	BDL	0.060	0.17	0.032	0.034

BDL = Below Detectable Limit

Table –5: Physico – Chemical Parameters of Water Samples Collected on 14-9-2011

Station No.	Temperature (^{0}C)	pH	Cr	Cu	Fe	Mn	Zn
S1	26.82	7.81	0.035	0.028	BDL	0.018	0.040
S2	27.24	7.70	BDL	BDL	BDL	0.023	BDL
S3	27.84	7.54	0.008	0.044	0.032	0.028	0.018
S4	27.83	7.51	0.052	0.042	0.13	0.014	0.026
S5	27.55	7.42	0.027	BDL	0.055	BDL	0.042
S6	27.71	8.15	BDL	0.041	BDL	BDL	BDL
S7	27.08	8.03	0.036	BDL	0.26	0.042	BDL
S8	27.23	8.14	0.072	0.026	0.036	0.031	0.030

Table –6: Physico – Chemical Parameters of Water Samples Collected on 13-10-2011

Station No.	Temperature (^{0}C)	pH	Cr	Cu	Fe	Mn	Zn
S1	27.8	7.83	BDL	0.02	BDL	BDL	0.045
S2	27.34	7.46	BDL	0.044	BDL	0.021	BDL
S3	28.11	8.05	0.008	BDL	0.042	0.048	BDL
S4	27.85	7.52	0.052	0.060	0.043	0.045	0.016
S5	27.73	7.85	BDL	BDL	0.055	0.018	0.052
S6	26.97	7.74	BDL	0.08	BDL	BDL	0.037
S7	28.21	7.96	0.026	0.046	0.056	0.026	BDL
S8	27.92	8.02	0.042	BDL	0.13	0.025	0.047

BDL = Below Detectable Limit

Source of support: Nil, Conflict of interest: None Declared