Physico-Chemical Analysis of Selected Ground Water Samples in and around Nagapattinam District, Tamilnadu

R. Padmavathy
Student
Department of Physics
E. G. S. Pillay Arts & Science College, Nagapattinam, India

S. Suganya
Student
Department of Physics
E. G. S. Pillay Arts & Science College, Nagapattinam, India

G. Janakiraman
Assistant Professor
Department of Physics
E. G. S. Pillay Arts & Science College, Nagapattinam, India

K. Senthilarasan
Assistant Professor
Department of Physics
E. G. S. Pillay Arts & Science College, Nagapattinam, India

V. Senthilmurugan
Head
Department of Physics
E. G. S. Pillay Arts & Science College, Nagapattinam, India

Abstract

The Present study deals with the physico-chemical parameters at selected areas of Nagapattinam and Thiruvarur district, Tamilnadu, India for the year December 2017. The study was carried out in the winter period. Groundwater samples were collected from different locations. Six samples were analyzed for their physic-chemical analysis. The obtained results are EC, TDS, pH, Alkalinity, Total hardness, chloride, Iron, Nitrate, fluoride, Sulphate values are compared with WHO.
Keywords: SMRF, Physico-Chemical parameters, ground water, Nagapattinam, Thiruvarur, WHO

I. INTRODUCTION

Water is one of the most important and abundant compounds of the ecosystem. All living organism on the earth need water for their survival and growth. As of now only earth is the planet having about 70% of water. But due to increased human population, industrialization, use of fertilizers in the agriculture and man-made activity it is highly polluted with different harmful contaminations. Therefore it is necessary that the quality of drinking water should be checked at regular interval, because of the usage of contaminated drinking water, human population suffers from varied of water borne diseases(1). Water is the elixir, is essential for the survival of all forms of life. Although statistics, the WHO reports that approximately 36% of urban and 65% of rural Indian were access to safe drinking water (2). In India ground water is intensively used in irrigation and industrial purpose, a variety of land and water based human activities are causing pollution to the ground water. Soil and geological formation containing high levels of heavy metals can lead those metals into ground water. This can be aggravated by over-pumping wells, particularly for agriculture. Pollution caused by fertilizers and pesticides used in agriculture are often causes dispersed over large areas. It is a great threat to the fresh water ecosystem. Pollution from ground water often causes diarrhoea and stomach irritation which can lead to more serve health hazards. Accumulation of heavy metals and some organic pollutants can lead to cancer, reproductive abnormalities and many more severe health problems (3).The present work is an attempt to measure the water quality of various ground water sources of Nagapattinam town, Tamilnadu, India.

II. MATERIAL AND METHODS

Ground water samples were collected from six bore wells in and around Nagapattinam town. The sampling stations are represented as S1 to S6. The water samples were collected in one litre polythene bottles. Before the collections of sampling bottles, it were soaked well, washed using double distilled water. At the time sampling, the sampling bottles were thoroughly rinsed three times using the ground water to be sampled. The sample were subjected to physic-chemical analysis.

III. RESULTS AND DISCUSSION

The results both physic-chemical of different ground water samples are presented in tables 1. These results were compared with values of prescribed standard quality of WHO.

A. Appearance and Odour

The appearance of ground water sample is clear in all locations and all the observed samples didn't have any odour.

B. Electrical Conductivity

Electrical conductivity is a measure of water capacity to convey electric current. The conductivity of water depends upon the concentration of ions and its nutrient status. Based on electrical conductivity values of the water quality can be classified as poor, medium or good. (4) The EC values are in the range of 436-3564µmhocm^{-1}. The electrical conductivity values are exceeding the permissible limit of 600 µmhocm^{-1} in all ground water sample. High electrical conductivity may be due to high concentration of inorganic salts, ionic constituents and dissolved minerals in the water sample (5). The highest value of electrical conductivity is found at station S6.

C. pH

It indicates the intensity of acidity and alkalinity and measure the hydrogen ion concentration in water. The pH value is an important factor in maintaining the carbonate and bicarbonate levels in water. The pH values are found to be within the permissible limit of WHO (6.5-8.5) in all the sampling stations for ground water sample (6). There are no abnormal changes in ground water samples.

D. Carbonate

The carbonate values are not detectable for the ground water samples. Since the observed pH is below 8.6, so the carbonate values are not detectable (7).

Table - 1
Physico-chemical parameters of ground water samples collected in the month of December 2017
S1-Viluthanmavadi, S2- Puthupalli, S3- Nagapattinam, S4- Panagal salai, S5-Kallikudi, S6-Madapuram.

Samples	Appear	Odour	EC	pH	TDS	ALK	TH	Cl	Fe	NO3	F	SO4
S1	clear	none	436	7.38	305.2	152	136	60	0	7	0.2	12
S2	clear	None	1137	6.97	795.9	408	328	148	0	4	0	16
S3	clear	None	235	6.84	1649.9	528	584	400	1.24	18	0	22
S4	clear	None	2152	7.12	1506.4	572	540	288	0.36	10	0.8	32
S5	clear	None	2524	6.98	1766.8	600	600	400	0	37	0.6	36
S6	clear	none	3564	6.89	2494.8	872	892	528	0	43	0.8	121

E. Total Dissolved Solids.

Total dissolved solids indicate the salinity behavior of ground water. TDS values varied from 305.2 to 2494.8 water containing more than 500 mg/L of TDS is not desirable for drinking water purpose. In the present investigation TDS values are higher than the prescribed limit given by WHO. The TDS concentration found to be in above permissible limit may be due to the leaching of various pollutants into the ground water which can decrease the potability and may cause gastrointestinal irritation in human and may also have laxative effect(8). High level of TDS may aesthetically be unsatisfactory for bathing and washing (9).

F. Alkalinity

Alkalinity is due to the presence of carbonate. Alkalinity itself is not harmful to human beings (10). Alkalinity value in the study area varied between 152-872mg/L. high values of alkalinity shows that it is not fit for domestic purpose. The Alkalinity values for all the ground samples are within the permissible limit except S6.

G. Total Hardness

In the present study, the total hardness values are observed in the range of 136-892 mg/L in ground water samples. The total hardness values are higher than the desirable limit of WHO in all the sample station except S1. This may be due to presence of bicarbonates, chloride and suplhates of Ca and Mg present in the water. Higher value of hardness may be mainly due to the contamination by large quantities of sewage and detergent. The high total hardness would lead to heart disease and kidney stone formation (11).

H. Chloride

The Chloride concentration serves as an indicator of pollution by sewage. People accustomed to higher chloride in the water are subjected to laxative effects (12). The chloride concentrations are found to be in the range of 60-528mg/L. The chloride values are matched by the permissible limit of WHO (600ppm) in the most of the ground water sample.

I. Nitrate

The nitrate values are found in the range of 4-43mg/L for the ground water samples. All the values of ground water sample are within the permissible limit of WHO (45ppm). The nitrate in water is responsible for the growth of blue green algae (13).

J. *Fluoride*

The fluoride in small amount is necessary for good health but higher concentration of fluoride causes dental fluoride and skeletal fluorosis. The value of fluoride for the ground water sample is recorded between 0-08mg/L. The fluoride values for all the ground samples are within the permissible limit.

K. *Sulphate*

Sulphate occurs naturally in water as a result of leaching from gypsum and other common minerals (14). The sulphate values are recorded within the range 12-121mg/L. The values of sulphate are permissible limit of WHO (250mg/L) in most of the ground water samples. High concentrations of sulphate are due to the effluent from industries and the run-off agricultural waste (15).

IV. CONCLUSION

The ground water samples were collected from six different places in and around Nagapattinam area. The samples were subjected to physic-chemical analysis. The result showed most of the parameters like TH, sodium, and cl are well within the permissible limit prescribed by WHO. Except Nagapatinam and Madapurm water are not potable water .The ground water sample is unfit for drinking and domestic purpose. According to WHO nearly 80% of all the diseases in human beings are caused by water.

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