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Chemical and Mechanical studies on Groundwater Samples Collected from Namakkal Town, Tamilnadu and Incorporation of Natural Polymeric Material

P. Thamilarasu[1], R. Sharmila[2] and K. Velusamy[3]

[1] Assistant Professor of Chemistry, Arignar Anna Government Arts College, Namakkal, India.
[2] Assistant Professor of Chemistry, Vivekananda Engineering College for Women, Namakkal.
[3] Associate Professor of Mechanical Engineering, AMS Engineering College, Namakkal, India.
Corresponding author email id: thamilarasu2011@gmail.com

Abstract - Groundwater quality study was carried out in the Namakkal Town water samples, Tamilnadu. The objective of this study is to identify the quality of groundwater especially in the town areas where groundwater is used for domestic, agriculture and industrial purposes. Ten locations of ground water samples were collected and studied for a month of January-2017. The present investigation is focused on the determination of Physico-Chemical and Mechanical parameters such as temperature, taste, Electrical conductivity, pH, hardness, total solids, total dissolved solids, total suspended solids, chlorides, sulphate, nitrate, fluorides, Dissolved Oxygen, corrosion resistance, abrasion resistance and strength of materials on water. Then, groundwater suitability was examined by using WHO and BIS standards. Therefore, the some of the water samples are not good agreement within the limits; those waters are treated with natural polymeric material like *Ricinus Communis* seed shell nano-aggregates, and then used for domestic, agricultural, industrial and machinery purposes.

Keywords

Bore well water, Water quality parameters, *Ricinus Communis,* WHO and BIS standards.

I. INTRODUCTION

Water is one of the abundantly available substances in nature. It is an essential constituent of all human beings, animals, vegetable matter and forms about 75% of the matter of earth crust. It is also essential in agriculture, manufacturing, transportation and countless other human activities. Water is required for the satisfactory performance of various life processes as a circulatory fluid as a carrier of nourishing food and for the removal of products of wastes. Water is not only essential for the lives of animals and plants but also occupies a unique position in industries. Probably, it's most important use as an engineering material is in the Steam generation. Water is also used as a coolant in power plants and chemical plants. In addition to it, water is widely used in other fields such as production of steel, rayon, paper, atomic energy, textiles, chemicals, ice, and for-conditioning drinking, bathing, sanitary, washing, fire-fighting etc [1]. The transportation vehicles and industries emit the lot of greenhouse gases like carbon-dioxide into the atmosphere which pollute our environment and create global warming and reduce rainfall. Hence we need for clean and green technologies for pollution abatement.

2. MATERIALS AND METHODS

S.NO	Sample Code	Name of Sample	Name of place
1	A	Sivagami	Gandhinagr
2	B	Gobalan	Kuttura colany
3	C	Suresh	Thirunagar street
4	D	Periyasamy	Murugan Kovil
5	E	Natarajan	Ashoknagar
6	F	Sampath_	Thillaipuram
7	G	Nateasan	Pillaiyar kovil st
8	H	Aathash	S.P. Pudur
9	I	Priya	Periyapatty
10	J	Ashokkumar	Kavetty patty

There are ten ground water samples i.e. bore well waters were collected in polythene bottles from the month of January – 2017, Namakkal district and the list of place can be given above, There is standard procedure has to be followed and study the physical, chemical and mechanical parameters of bore well waters [2].

3. RESULTS AND DISCUSSION

The results are presented in the following tables and detailed discussion of all the parameters is given below,

3.1. PHYSICAL PARAMETERS

Table 1. Physical parameters

S.No	Sample Code	Colour	Odour	Temperature	Taste	EC, mS/cm	TS, mg/lt	TDS, mg/lt	TSS, mg/lt
1	A	colourless	odourless	26	normal	1.51	680	678	2
2	B	colourless	odourless	25	salty	1.25	760	751	9
3	C	colourless	odourless	27	normal	0.48	310	304	6
4	D	colourless	odourless	28	normal	1.18	708	701	7
5	E	colourless	odourless	29	salty	1.49	872	864	8
6	F	colourless	odourless	27	normal	0.9	546	543	3
7	G	colourless	odourless	27	normal	0.8	485	482	3
8	H	colourless	odourless	25	normal	0.92	270	268	2
9	I	colourless	odourless	25	normal	1	589	565	24
10	J	colourless	Odourless	26	salty	1.3	752	750	2

*EC = Electrical conductivity; TS = Total Solids; TDS = Total Dissolved Solids;
*TSS = Total Suspended Solids

The results of physical parameters are given in the table1. All the bore well water samples were colourless, clear and odourless indicating the absence of colloidal substances, suspended and decomposed vegetation. The sample code B, E and J samples are salty and remaining are normal taste. Conductance of water samples varied from 0.8 to 1.51 mS/cm. But all the water samples were relatively higher conductivity, which may be due to contamination of conducting materials in water samples [3]. According to BIS Standards, the acceptable limit of TDS in ground water around 500 mg/L. As per classification of TDS bore well water of Namakkal area come under moderately high especially sample code A, B, D, E and J. Total solids and TDS include volatile and non-volatile solids. The presence of excessive solids in water indicates pollution which can lead to a laxative effect [4].

3.2. CHEMICAL PAPRAMETERS

Table 2. Chemical Parameters

S.No	Sample Code	pH	TH, mg/lt	TA, mg/lt	Chlorides	Sulphates	Nitrates	Fluorides	DO, mg/lt
1	A	7.10	440	400	181	185	70	0.9	8.5
2	B	7.80	390	425	270	285	65	1.5	6.2
3	C	7.60	180	200	81	201	50	0.8	8.7
4	D	7.90	450	300	207	185	43	0.5	9.0
5	E	7.50	535	325	295	278	70	1.6	6.0
6	F	7.09	405	375	131	160	44	0.4	8.3
7	G	7.48	330	425	104	152	40	0.5	8.4
8	H	7.54	180	200	79	144	38	0.5	6.1
9	I	7.11	330	375	168	168	35	0.6	8.3
10	J	7.50	415	475	291	283	78	1.4	6.4

*TH = Total hardness, TA = Total Alkalinity, DO = Dissolved Oxygen

The chemical parameters of water samples are tabulated in table 2. The collected bore well water samples have pH within the permissible limits ranging from 7.10 to 7.90. Total hardness of sample code E has moderate values which due to the slightly higher concentration of calcium and magnesium salts. Samples A, B, and J have slightly high concentration of alkalinity and exceed the permissible limits proposed by BIS. High alkalinity in water bodies leads to sour taste and salinity. Samples B, E and J have moderately high concentration of chloride content and exceed the permissible limit proposed by BIS. High chloride content in water bodies harms metallic pipes and structure as well as agricultural crops [5]. Samples B, E and J have slightly high concentration of sulphate and exceed the permissible limit proposed by BIS. High sulphate concentration in water bodies leads to gastro-intentional irritation. The excess sulphate causes risk to human beings as algae produces toxins, which damage neurological system [6]. Samples B, E and J have slightly high concentration of fluoride and exceed the permissible limit proposed by BIS. High fluoride concentration values may be causes fluorosis, which is characterized by mottling of teeth-enamel, nervous and skeletal disorder [7].

3.3. MECHANICAL PARAMETERS

The mechanical parameters like corrosion resistance, abrasion resistance and strength of materials on water are studied. The sample code B, E, and J are not much corrosion resistance, abrasion resistance and strength also gradually decreased compared to other samples.

4. Incorporation of Natural Polymeric Material into water samples.

Ricinus Communis seed shell nano-aggregates are investigated those of the samples moderately high values. Then, the results are correlated with WHO and BIS standards. Treated water have the within the limits of WHO and BIS standards. Therefore, those waters are to be used after treatment for drinking and industrial purposes [8].

IV. CONCLUSION

There are ten water samples are collected in Namakkal town, Tamilnadu. The various physical, chemical and mechanical parameters were studied. The results shown that, water sample code B, E and J, those sample values are moderately high value compared to the WHO and BIS standards which may not be fit for long period of months for drinking and industrial purposes. But, treated with *Ricinus Communis* seed shell nano-aggregates and then used for drinking and industrial purposes**.**

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