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Adsorption of Arsenic from SalineWater from Murtizapur Region, Rajura- Ghate Dam

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Abstract: The presented study deal with the adsorption efficacy of heavy metals arsenic from saline damp water of Rajura Ghate Village near to Murtizapur tehsil. To finding the amount how much ppm of As (III) adsorption effectiveness from water, the study assessed the characteristics of the prepared materials and the experimental conditions. The study was optimized the experimental condition with a dosage of 1 g/ L, contact time of 90 min, the solution pH of 8, and the initial concentration of 3-4 ppm of As (III). The optimization was carried out in distilled water and later the experiments were conducted in the real polluted saline water. The physical characteristics were investigated using techniques colorimetric methods for arsenic detection in water. The experimental result shows the adsorption efficiency of, the detection limit and quantitation limit were found to be 0.109 and 0.446 μg mL^{-1}, respective of As (III). The optimized a method's performance was carried out using UV-vis spectroscopy during the experimental methods.

Keywords: pollute water, arsenic metal, UV-vis spectroscopy hardness range.

Introduction:

Water is an essential component on earth that is fundamentalparts to the existence of life on earth, thus making living impossible without it. Near about 70.9% of the Earth's space is covered with water, providing habitation for many of the organisms in the ecosystem.Currently, the World Water Council reported that near about 1.2 billion people globally lack access good to quality water.This is due to increasing world population, irrigation, industrialization, and consequently overexploitation, which has stressed the water situation globallyconstant exposure of the naturally occurring water resources to different sources of contamination has lowered their fitness for consumption.

Exposure to some classes of heavy metals (HMs), even in trace concentrations could pose a serious threat to humans, while exerting harmful consequences on the ecosystem, and other biological receptorsthey are comprised of some metalloids, transition metals, actinides, and lanthanides. Among them, 17 elements are classified as being both extremely toxic , some others (Pb, Cd, Hg, As, Sb, Cr, etc.) are highly toxic even in trace concentrations, could adversely organic matters, and are also harmful to humans. With significant exposure in humans (through contact with some parts of the body, especially the mouth, skin, and airways) and subsequent adsorption and attachment to the erythrocytes, Pb could lead to pathological changes in the endocrine system and kidney which could cause failure in reproduction. Therefore, reliable identification and efficient extraction of these metals from water, especially for domestic, communal, and industrial uses, has become very significant and drawn a lot of attention on diverse research fronts.

Arsenic is very toxic in its inorganic form particularly in the form of arsenite which is one hundred times more toxic than arsenate.Inorganic arsenic is naturally present at high levels in the groundwater in several countries, including Bangladesh, India, Pakistan, China and Vietnam.Continuous consumption of water thatcontains high levels of arsenic results in arsenicosis. The symptoms of arsenicosis include skin lesions, different forms of cancer, birth defects and premature death.Although these are sensitive and reliable methods for arsenic detection in low concentrations, they are costly and require these techniques like atomic absorption spectroscopy (AAS), induced coupled plasma atomic emission spectroscopy (ICP-AES), X-ray fluorescence and atomic fluorescence spectroscopy are not suitable for in situ measurements. However, very few commercially available microfluidic detection systems have been developed for heavy metal monitoring in water. Electrochemical sensors have been used for different heavy metal detection.

A wide variety of chromophoric dyes exist for heavy metal detection and quantification in aqueous solutions (Sareen 2004). In order to incorporate colorimetric methods into microfluidic detection system for arsenic detection in wateroptimization and throughout assessment is required. The dyes must be limited specificity, turbidity and poor sensitivity must be overcome. Also, the method should be rapid and yield reproducible results(Yogorajah, Tsai 2015). This present work deal with to study of selective and sensitive analytical method for arsenic detection in water. In this method leuco malachite green (LMG) dye is used. Arsenic is reacted with acidified potassium iodate to liberate iodine. The liberated iodine selectively oxidizes LMG to malachite green (MG) dye. Addition of sodium acetate buffer results in green color formation. The MG dye has absorption maximum at 617 nm.Thepurposed of this study to quality of water must be safe physically, chemically, and biologically to be regarded as useful for drinking and other domestic purposes.

2. Experimental

2.1Apparatus Shimadzu 1800 UV- visible spectrometer was used with 1 cm quartz cuvettes for the absorbance measurements. pH meter was used for pH measurements.

2.2 Reagents:

All chemicals used were of analytical grade, and double deionized water was used for dilution of reagents and samples. As (III) stock solution (1000 mg L-1) from SigmaAldrich was used. Working standards were prepared by appropriate dilution of stock solution. Potassium iodate: 1%, hydrochloric acid: 1M, leuco malachite green dye: 0.05%, sodium triacetate buffer: 13.6% were used.

2.1Samples collection

water samples were collected fromMurtizapur Region, Rajura- Ghate Damstudy area. The collected water samples represented sources including, household wells, public water, damp water, sampling plan and the parameters of each sampling.The samples were collected in Food grade PE bottles that were previously rinsed with 10% nitric acid solution and dried.

2.2Arsenic determination

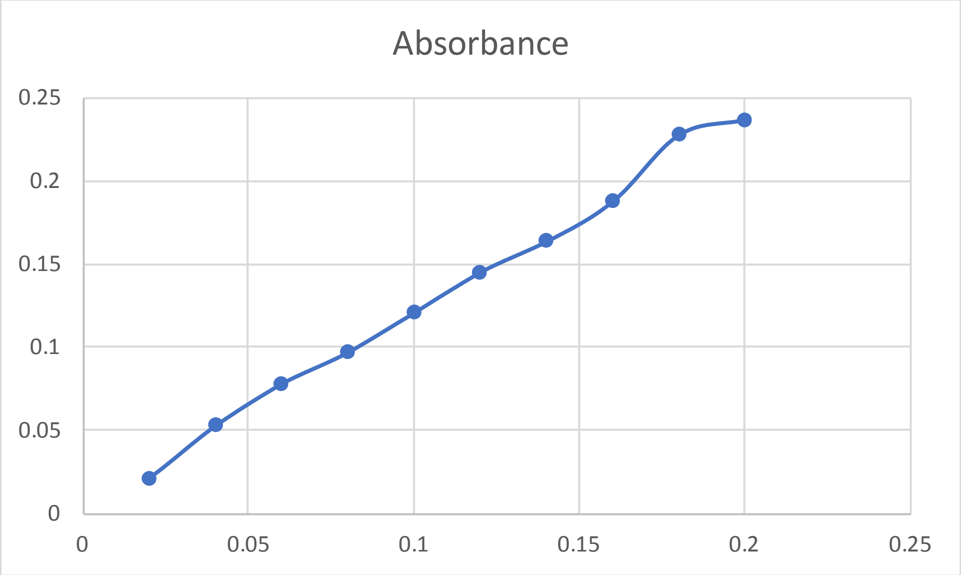
All glassware used in the analysis was previously washed with deionized water and immersed overnight in a 10% nitric acid solution. Then washed with deionized water and dried in the oven at 100 ^{0}C

2.3 Preparation of calibration curve.

As (III) stock solution (1000 mg L-1) from SigmaAldrich was used. Then prepared 0.02M to 0.2M series solution from Arsenic stock solution in small 100 ml reagent bottle. In this series of solution, we added Potassium iodate (1%, 1ml) then hydrochloric acid (1 M, 0.5 ml), and the mixture was gently shaken and left for 5 min.Leuco malachite green dye was 0.5 ml, followed by sodium triacetate buffer 2 ml. The mixture was gently shaken and kept for 10 min. The absorbance was measured at 617 nm against reagent blank.

The calibration curv observed for given data as shown in table 2.1

Sr no	Conc (µg mL1)stock solution	Absorbance from calibration curve
1	0.02	0.021
2	0.04	0.053
3	0.06	0.078
4	0.08	0.097
5	0.10	0.121
6	0.12	0.145
7	0.14	0.164
8	0.16	0.188
9	0.18	0.228
10	0.20	0.237



3. Results and discussion:

3.1 Analytical data:

Water samples collected from Rajurghate damp areas of district Akola were analyzed for presence of heavy metal contents. The presence of heavy metals such as arsenic (As). were analyzed for their presence and compared with different parameters. The physical parameters were determined which provided general information about water quality in qualitative terms and include water quality parameters like color, physical appearance, transparency,dors, pH, taste and turbidity.The overall average pH of all the collected samples were 8-9pH.Most of the sampling areas were having the normal 8.4 pH value

The collected sample of water mixed with different ratio of chemical regents and finding the results: Regent ratio for well water, damp water

1) 2.5ml of water sample :1% potassium Iodied 2ml : 1M HCL solution 2ml :LMG dye (0.5):0.5ml sodium triacetate buffer 2ml and record the spectroscopy absorbance at 617 nm against reagent blank.
2) 5ml of water sample :1% potassium Iodied 2ml : 1M HCL solution 2ml :LMG dye (0.5):0.5ml sodium triacetate buffer 2ml and record the spectroscopy absorbance at 617 nm against reagent blank.

The various sources including, household wells, public well water, damp water, sampling the arsenic are found as follow.

Water source	household well	public well water	damp water
Ragjura Ghate area sample (A)	1.025ug/l	2.305ug/l	6.780 ug/l
sample (B)	1.048 ug/l	2. 508 ug/l	7.899 ug/l
sample (C)	1.052 ug/l	2.502 ug/l	7.920 ug/l

4. Conclusion:

This paper reports the finding of arsenic metal by using simple technique of leuco malachite green for the spectrophotometric determination of arsenic and examines the method's potential incorporation The method is simple, fast and cost effective and requires only small amount of chemicals, thus making it environmentally safe. The results obtained in this study showed an elevated level of arsenic >10 ug/l in water from household wells. Considering the health risk from continuous exposure to arsenic > 10ug/l in drinking water, there is an urgent need to reduce the arsenic level in water from private wells by installing small household water treatment units in homes and water purification units in public institutes such as schools and hospitals that rely on groundwater sources.

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