Chemical Sciences Journal

Fazal-ur-Rehman and Haider, Chem Sci J 2018, 9:1
DOI: 10.4172/2150-3494.1000179

Research Article Open Access

Estimation of Chloride Hardness in Drinking Water in University of Education, Vehari Campus, Vehari, Punjab, Pakistan

Fazal-ur-Rehman M* **and Hafiz Zeshan Haider**

Department of Chemistry, University of Education, Lahore-Vehari Campus, Punjab, Pakistan

***Corresponding author:** Fazal-ur-Rehman M, Department of Chemistry, University of Education, Lahore-Vehari Campus, Punjab, Pakistan, Tel: +923467088517; E-mail: fazalurrehman517@gmail.com

Received date: November 26, 2017; **Accepted date:** January 11, 2018; **Published date:** January 18, 2018

Abstract

The drinking water in University of Education Vehari (UEV) was analyzed to monitor its Chloride hardness. This project was performed in chemistry Lab of UEV. The chemical/analytical test used to analyze the water Chloride hardness was Argentometric Titration or Mohr Method of analysis. In this test, a water sample was tested properly in chemistry lab. From the results, the molarity of Chloride content was calculated. The molarity of resulted Chloride was 0.0133, showing the most hardness of water. It is declared that due to hardness of Chloride amounts in drinking water, the water of university is unfit for drinking. This concentration of Chloride ions in very small water sample is too much. In normal, we daily intake 6-8 glasses of water which means 800-1000 ml or 1 L daily. If we calculate this concentration for 1 L, it will be most dangerous especially for human health. Chloride hardness causes various typical issues, for example, evaporator scaling, washing, spots on sink, sturdiness of hair and skin. It is also said that hard water causes diverse therapeutic problems; for example, urolithiasis, cardiovascular confusion, kidney problems, anencephaly. It can cause most of stomach diseases in humans. So, authors recommended using this water after boiling, filtration or chlorination of water.

Keywords: Sodium bentonite; Cetyltriammonium bromide; Titration; Meta-xylene; Kinetic model equations; Remediation; Argentometric

Introduction

Common assets are the imperative abundance of our nation, water is one of them. Water is a meander of the nature. "No existence without water" is a typical motto relying on the way that water is one of the normally happening fundamental prerequisites of all life supporting exercises [1]. Water is a requisite natural resource on earth. Safe drinking water is the prime need of every human being [2]. It is a dynamic framework, containing living and in addition non-living, natural, inorganic, solvent and additionally insoluble substances. So its quality is probably going to change step by step and from source to source. Water quality parameters are the physical, substance and organic attributes of water [3]. The water which entities drink and use for different reasons for existing is perfect water [4]. This infers the water must be free of germs and chemicals and be cleared. Safe drinking-water is a fundamental requirement for human advancement, and wellbeing. So, it is a globally acknowledged human right [5].

Groundwater is the real source of drinking water [6]. Over half population on the earth relies on ground water. Just 1% section is accessible ashore to drink, agribusiness, local power era, modern fulfilment, transportation and waste transfer [7]. By and large, drinking water containing distinctive Calcium and Magnesium salts and other overwhelming metals including Cd, Cr, Co, Hg, Ni, Pb, Zn and so on [8].

Hard water contains a higher than typical grouping of Calcium and Magnesium particles [9]. The explanation for is shake sort, sedimentary shake, which is rich in Calcium and Magnesium [10]. Water hardness causes various distinctive issues, for example, evaporator scaling, washing, spots on sink, sturdiness of hair and skin. It is additionally said that hard water likewise causes different medical issues like as urolithiasis, cardiovascular confusion, kidney issues, anencephaly and disease [11-14]. Most extreme reasonable level endorsed by WHO for drinking water is 500 mg/l as set. As per a few orders, water having hardness up to 75 mg/l is named soft, 76-150 mg/l is decently soft, 151-300 mg/l as hard and more than 300 mg/l as very hard [15].

New water shortage is expanding internationally on account of overpopulation [16-18]. Numerous scientists have likewise dealt with the water and human right [19]. The extreme ingestion of any one of these salts and overwhelming metals including Cd, Cr, Co, Hg, Ni, Pb and Zn effectively affect human wellbeing [20]. The total population is expanding step by step and this ceaseless increment in population brings about lack of new water accessibility around there. The persistent expanding population raises the necessity of water for the generation of sustenance stuff, agribusiness, industry and the local usage [21]. In Pakistan drinking water is persistently being disintegrated because of untreated civil and mechanical water and waste from farming profluent. There are various potential sources that can make the pollution of water make it hazardous for drinking [22].

Experimental

Chemicals

Water sample (collected from Girls Hostel in University of Education Vehari Campus), Silver Nitrate ($AgNO_3$) solution (0.01 M), Eriochrome Black-T (indicator).

Methods

The water sample was taken from girl's hostel in University of Education Vehari Campus and was analyzed to check its Chloride hardness. First of all, we washed all the apparatus with distilled water and dried them on oven, then weighed 0.1698 g $AgNO_3$ on electrical balance. We took 100 ml conical flask, added weighted $AgNO_3$ in it, filled up to the mark and then shook it well [23-25]. It was 0.01 M $AgNO_3$ solution. Then, we took a 10 ml water sample in a flask. Added few drops of indicator in sample flask and sample color was changed into wine red. After this, we took a burette and filled it with 0.01 M $AgNO_3$ up to zero mark. By using burette, titrated the sample until the purple blue color was appeared which was endpoint. Repeated the experiment and calculated the molarity of sample (Table 1).

Preparation of 0.01 M $AgNO_3$ solution:

1 M=169.8 g/1000 ml

1 M=16.98 g/100 ml

1/100 M= (16.98 g/100) ×100 ml

0.01 M=0.1698 g/100 ml

No.	Initial volume of $AgNO_3$ used (V_i) ml	Final volume of $AgNO_3$ used (V_f) ml	V_f-V_i=V_1 ml
1	0	13.5	13.5
2	13.5	26.5	13
3	26.5	40	13.5
Average=13.33 ml			

Table 1: Concentration of Silver nitrate ($AgNO_3$) used in Chloride containing water.

M_1=0.01 M, V_1=13.33 ml, n_1=1, M_2=?, V_2=10 ml, n_2=1

$AgNO_3$=Chloride ion

$M_1V_1n_1=M_2V_2n_2$

$0.01 \times 13.331=M_2 \times 10 \times 1$

$M_2=0.01 \times 13.331/10$

M_2=0.0133.

Results and Discussion

The molarity of resulted Chloride was 0.0133, showing the most hardness of water. After the analytical tests, it is resulted that the water sample of girl's hostel in University of Education Vehari Campus is very hard and unfit for drinking because it contains 0.013 molar Chloride ions per 10 ml of water sample. This concentration of Chloride ions in very small water sample is too much while, normally we daily intake 6-8 glasses of water i.e., 800-1000 ml or 1 L daily [26-28]. If we calculate this concentration for 1 L, it will be most dangerous especially for human's health. So, it is not safe to drink, because of contamination of high amounts of Chloride contents more than suitable recommended amount of Chloride acceptable for health. Chloride hardness causes various distinctive issues, for example, evaporator scaling, washing, spots on sink, sturdiness of hair and skin. It is additionally said that hard water likewise causes different medical issues like as urolithiasis, cardiovascular confusion, kidney issues, anencephaly and disease.

Conclusion

From the results, the molarity of resulted Chloride was 0.0133, showing the most hardness of water. It is declared that due to high hardness of Chloride amounts in drinking water, the water of girl's hostel in University of Education Vehari Campus is unfit for drinking. This hardness causes health diseases in humans. Chloride hardness causes various typical issues, for example, evaporator scaling, washing, spots on sink, sturdiness of hair and skin. It is also said that hard water causes diverse therapeutic problems; for example, urolithiasis, cardiovascular confusion, kidney problems, anencephaly. It can cause most of stomach diseases in humans. So, authors recommended using this water after boiling, filtration or water treatment by an expert chemist specialized in relevant field of analysis. Treatment of water must be done by an expert chemist, because the unusual amount of chlorine is also much toxic for health of humans.

References

1. Atakpu L (2007) Resource-based conflicts: Challenges of oil Extraction in Nigeria; paper presented at the European Conference hosted by German European Council Presidency, Berlin, Germany.
2. Odulari GO (2008) Crude oil and the Nigerian economic performance. Oil and Gas Business: World Trade Organization centre, Willian Rappard, Geneva.
3. Guggenheim S, Martin RT (1995) Definition of Clay and Clay Mineral: Joint Report of the AIPEA Nomenclature and CMS Nomenclature Committees. Clay Clay Miner 43: 255-259.
4. Souza SP (2002) Science and Technology of Clays. 2nd edn. Sao Paulo, England Blucher.
5. Jacobs JD, Kaerner H, Heinz H, Farmer BL, Mirau P, et al. (2006) Alkyl ammonium intercalates within organically modified montmorillonite: dielectric relaxation and ionic conductivity. J Phy Chem 110: 20143-20157.
6. Xue W, He H, Zhu J, Yuan P (2007) FTIR investigation of CTAB-AL-Montmorillonite complexes. Spectrochemica Acta Pat A 67: 1030-1036.
7. Ghafari S, Aziz HA, Isa MH, Zinatizadeh AA (2009) Application of response surface methodology (RSM) to optimixe coagulation-flocculation treatment of leachate using polyaluminium Chloride (PAC) and alum. J Hazard Mater 163: 650-656.
8. Al QMH, Mekhemer WK, Zaghloul AA (2005) The adsorption of Cu (II) ions on bentonite – A Kinetic Study. J Coll Interf Sci 283: 316-321.
9. Safa OA, Erdem O, Ozcan BA (2004) Adsorption of acid blue 193 from aqueous solution onto Na-bentonite and DTMA-bentonite. J Coll Inter Sci 280: 44-54.
10. Grim RE (1962) Applied Clay Mineralogy. 2nd edn. McGraw Hill Book Company, New York.

11. Zhu H, Du ML, Zhou ML, Xu CS, Fua YQ, et al. (2012) Facile and green fabrication of small, mono-disperse and size-controlled noble metal nanoparticles embedded in water-stable polyvinyl alcohol nanofibers: high … Dalton Transition. J Coll Interf Surf 41: 10465.
12. Aktar M, Hasary SN, Bhanger MI, Iqbal S (2007) Sorption potential of moringa oleifera pods for the removal of organic pollutants from aqueous solutions. J Hardard Mater 141: 546-556.
13. WHO (2004) Guidelines for Drinking Water Quality. World Health Organization Distribution and Sales, Geneva, Switzerland.
14. Yadaz N, Calimi A (2002) Alteration of three Turkish bentonites by treatment with Na2CO3 and H2SO4. Turk J Chem 26: 393-401.
15. Lagergren S (1898) Zur theory of the so-called adsorption geloster stoffe. Royal Swedish Academy of Sciences, Documents 24: 1-3.
16. Ho YS, Mckay G (1998) Kinetic models for the sorption of dye from aqueous solution by wood. Process Safety Environ Protect 76: 183-191.
17. Weber Jr WJ, Morriss JC (1963) Kinetics of adsorption on carbon from solution. J Sanitary Eng Div Am Soc Civ Eng 89: 31-60.
18. Jiang MQ, Jin XY, Lu XQ, Chen ZL (2010) Adsorption of Pb (II), Cd (II) Ni (II) and Cu (II) onto natural kaolinite clay. Desalin 251: 33-39.
19. Chen R, Peng F, Su S (2008) Synthesis and characterization of novel swelling tunable oligomeric poly (styrene-co-acrylamide) modified clays. J Appl Polym Sci 108: 2712-2717.
20. Oladoja NA, Aboluwoye CO, Oladimeji YB (2008) Kinetics and isotherm studies on methylene blue adsorption onto ground palm kernel coat. Turk J Eng Sci 32: 303-312.
21. Sidmara B, Maria FO, Melissa GAV (2013) Adsorption of toluene in batch system in natural clay and organoclay. Ital Assoc Chem Eng 32: 313-318.
22. Zhou L, Chen H, Jang X, Lu F, Zhou Y, et al. (2009) Modification on montmorillonite surfaces using a novel class of cationic Gemini surfactants. J Coll Interf Sci 332: 16-21.
23. Paiva LB, Morales AR, Diaz FRV (2008) Organoclays: Properties, preparation and applications. Appl Clay Sci 42: 24.
24. Wambu EW, Muthakia GK, Wa-Thiog'O JK, Shiundu PM (2011) Kinetics and thermodynamics of aqueous Cu (II) adsorption on heat regenerated spent bleaching earth. Bull Chem Soc Ethopia 25: 181-190.
25. Kannan N, Sundaram MM (2001) Kinetics and Mechanism of removal of methylene blue by adsorption on various carbons – A Comparative Study. Dyes Pigments 51: 25-40.
26. Sun S, Wang A (2006) Adsorption kinetics of Cu (II) ions using N, O-carboxyl methyl chitosan. J Hazard Mater 131: 103-111.
27. Aroke UO, El-Nafaty UA, Osha OA (2014) Removal of oxyanion contaminant from waste water by sorption onto HDTMA-Br modified organo-kaolinite clay, North-Eastern, Nigeria. Inter J Emerg Technol Adv Eng 4: 475-484.
28. Wang L, Wang A (2008) Adsorption properties of congo red from aqueous solution onto surfactant-modified montmorillonite. J Hazard Mater 160: 173-180.