ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 10, Issue, 01(E), pp. 30517-30520, January, 2019

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

EFFECT OF MAGNETIC TREATMENT OF WATER ON THE REDUCTION OF HEAVY METAL CONCENTRATION

Ayat Khairi Hashim., Seroor Atalah Khaleefa and Mohammed Ibrahem

Department of Environmental Engineering, College of Engineering, Mustansiriyah University. Baghdad – Iraq

DOI: http://dx.doi.org/10.24327/ijrsr.2019.1001.3075

ARTICLE INFO

Article History:

Received 06th October, 2018
Received in revised form 14th November, 2018
Accepted 23rd December, 2018
Published online 28th January, 2019

Key Words:

Magnetic field, magnetic water treatment, heavy metals, lead, copper, cadmium.

ABSTRACT

The present study aims to investigate the effect of magnetic water treatment on the reduction of concentration of heavy metals in water. In this study, tap water was used by passed it in magnetic field in three magnetic strengths (three intensities) and 0.02l/s flow rate in continuous treatment process. Heavy metals of samples were measured before and after magnetic treatment every 60 minutes for two hours.

After comparing the results obtained before and after the magnetic treatment, it was found that the highest change occurred in the results at the magnetic intensity (5000 G) and the highest decrease in heavy metals were found lead 35.9%, cadmium 54.2%, copper 35.7%.

INTRODUCTION

Water molecule contains one oxygen and two Hydrogen atoms covalently bounded, the molecule resulting is stable, does not carry a net electrical charge, has no unpaired electrons [1], figure (1) shows the molecule of water.

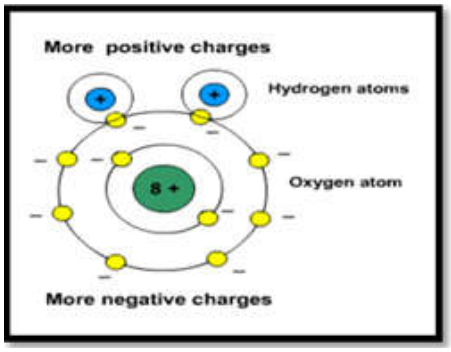

Figure 1 Molecule of H_2O

The molecule possesses a positive charge on one end and a negative charge on the other Because of the two hydrogen atoms sharing electrons on one end. The dipole moment is a vector quantity and is responsible for solubility which is one of the most important properties of water. Figure (2) shows how the dipole moment of a water molecule is similar to a magnet.

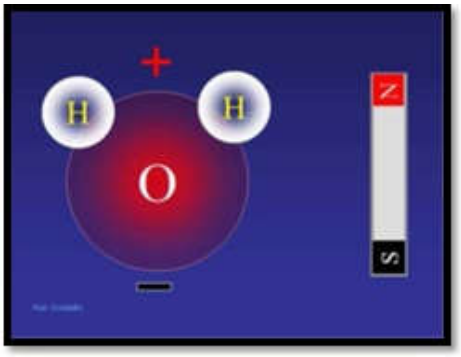

Figure 2 Water molecules, Dipole moment of a molecule

When using magnetic field for water treatment, the covalent bounded will be broken and this lead to absorbed more energy, thus reducing the boundary between the water molecules and increasing electrical decay which effected crystal decay [2].

The molecules of water could be either not polar or polar. Under influence of the magnetic field, we can change the molecules of water from non-polar to polar and a non-polar molecule becomes polarized they will be charges, this charge will pulling them together [3]. Magnet also reduces the bond angle between hydrogen-oxygen within the water molecule from 104.45˚ to 103˚ [4], figure (3) shows the water molecules

Corresponding author:* **Ayat Khairi Hashim
Department of Environmental Engineering, College of Engineering, Mustansiriyah University. Baghdad – Iraq

before and after magnetic treatment. Many researchers confirm total fruit yield like tomatoes [5], or increase the health of human body, or the effect on weight and number of sunflower plant [6] are due to magnetic field. Constant magnetic field's effect was studied of direct impact on properties of wastewater modification [2].

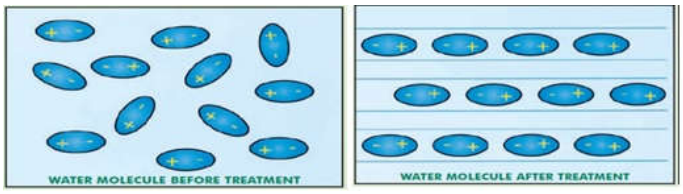

Figure 3 Water Molecules Before and After Magnetic Treatment [7]

According to [1] due to the magnetic field influence, different orientation was attained for polar molecules. Dipoles numbers are greater in the direction of field is affected to the stronger the magnetic field.

Magnetic water treatment (MWT)

Magnetic water treatment is the process of exposing water for a magnetic field to induce some changes of chemical and physical properties of water, MWT is a type of water treatment that is used in many different fields like medical, environmental, industrial and agriculture [8].

The magnetic treatment method has been applied in water and wastewater systems of industrial and domestic to control the corrosion. Attention is paid to magnetic treatment during the last years.

The objective for this study comes from the fact that such a simple technology has beneficial effect on many applications and impact on industries utilizing water. The technology of MTW is cheap, requires no energy to run, and creates no pollutants. Besides the method of magnetic treatment of water requires no chemical reagents, and is therefore environmentally friendly [9].

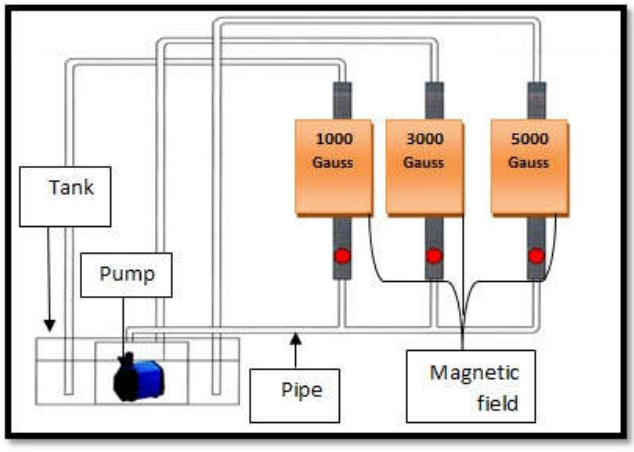

Figure 4 Magnetic water system

(MWT) is a relatively new technique in environmental management. When water is exposed to magnetic field, it will change the chemical and physical properties of water molecules resulting in unique characteristics. Magnetized water has shown different properties with applications used in various fields of environmental management. Scale prevention, plant growth, soil enhancement, water saving, crop yield, and wastewater treatment are some of these applications. After the magnetic treatment of water, the structure of the water molecules will change into a small, uniform and hexagonally structured group that is easy to pass through the passages in plant and animal cell membranes. These features make MW a bio-friendly compound for human, animal and plant cells [6].

Magnetic water treatment results in changes in the transition character of the electrons in the water molecules due to the alteration of the polarization properties of the molecules and their distribution in magnetized water [10].

Heavy metals

Heavy metals are defined as any metal element and metalloid that has almost high density that ranges from 3.5 to 7 g cm3 and is poisonous or toxic at low concentrations, also includes zinc (Zn), thallium (Tl), copper (Cu), chromium (Cr), cadmium (Cd),mercury (Hg), lead (pb), arsenic (As), and nickel (Ni). Exposure to these metals, food, and water supply may result in health effects. Chemical properties of heavy metals are different, and are used in electronics and machines extensively, and in high-tech applications. They are able to enter into the food chains and aquatic and of humans and animals from a variety of sources of anthropogenic as well as from the rocks and soil natural geochemical weathering. Mining wastes, landfill leaches urban runoff the main sources of contamination, municipal wastewater and industrial wastewaters from different industries [11].

Experiment Method

Magnetic Treatment Design

The design and configuration of the MTD to be used in these experiments consists of a main pipe which is divided into three branches where the water flows through them using water pump, each branch pipe (1, 2, 3) is fixed on magnet field with a certain strength (1000, 3000 and 5000 G), and each branch pipe contains a valve to control discharge of water passing through, as shown in figure (5).

Figure 5 Magnetic Treatment Design

Measured concentration of heavy metals (pb, cd, cu)

Heavy metals were measured before and after using magnetic treatment of water in the Laboratory Service Center of Baghdad University, collage of education for pure science – Ibn –Al-Haitham by using analysis device atomic absorption flame spectrophotometer as shown in plate (3-7).

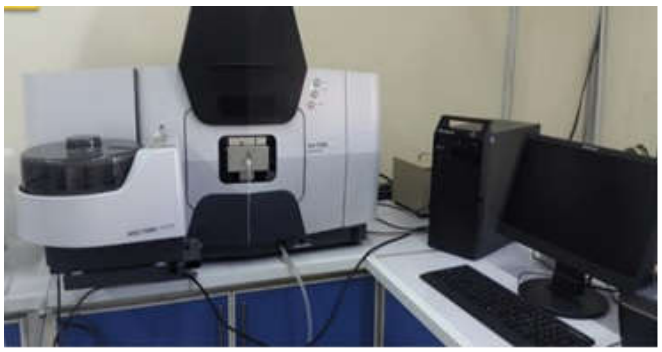

Figure (6) Atomic absorption flame spectrophotometer (A-shimadzuaa-7000f, Japan)

Results of concentration of heavy metals

Figures (7), (8) and (10) shows the decreasing in concentration of heavy metals after using magnetic treatment of water, the maximum decrease shown in figures when (intensity=5000G).

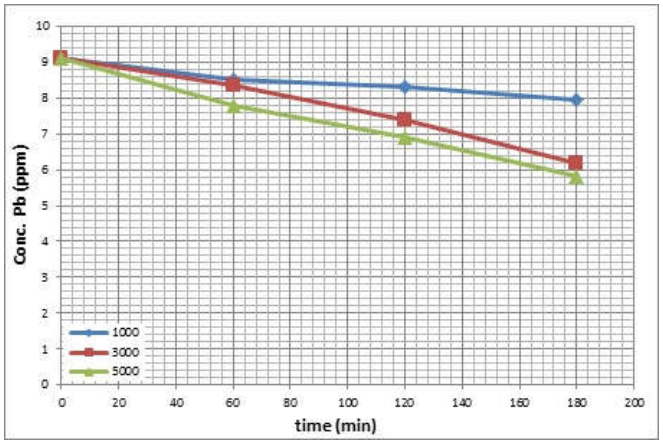

Figure 7 Relation between Concentration of lead and time at different intensities

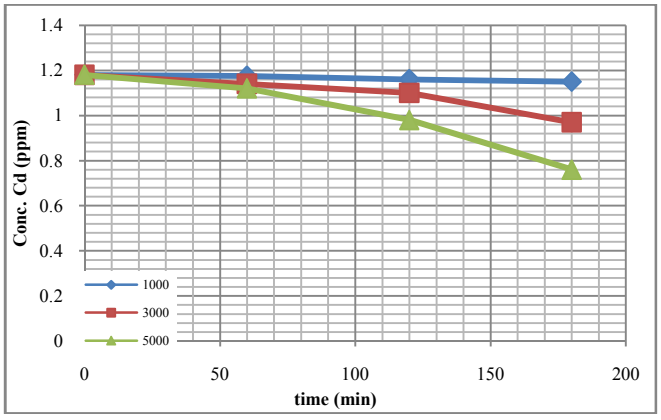

Figure 8 Relation between Concentration of Cadimum and time at different intensities

The reason of decrease is due to the reduction of the concentration of ions when the water is exposed to a magnetic field and this reduces the negative effects of these ions [12], or to formation the salts of ions [13].

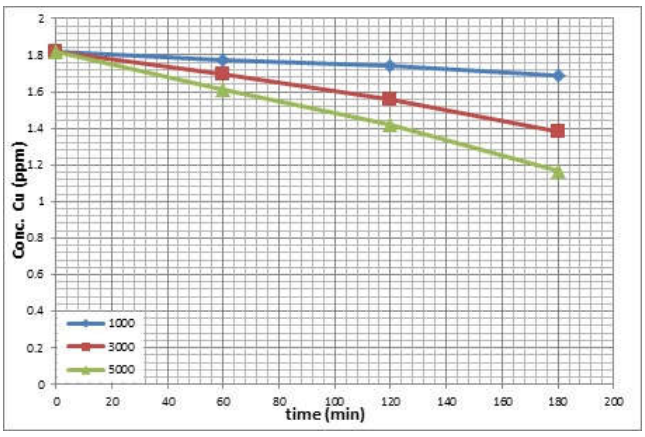

Figure 9 Relation between Concentration of copper and time at different intensities

CONCLUSION

The effect of magnetic treatment of water to reduce heavy metal concentration increase at the magnetic field intensity increased.

Acknowledgments

The authors would like to thank Mustansiriyah University (www.uomustansiriyah.edu.iq) Baghdad – Iraq for its support in the present work.

References

S. R.M, "Bio Molecules", Discovery Publishing House, India, 2004.

Dr. Gaafar M. Moosa, M.Sc. jabbar Hussain. Khulaef, Ali Chaloob Khraibt, Niehad Raheem Shandi and Dr. Mohamed S.K Al Braich, "Effect of Magnetic Water on Physical Properties of Different Kind of Water, and Studying Its Ability to Dissolving Kidney Stone", *Journal of Natural Sciences Research*, Vol.5, No.18, 2015.

C. Jack Quiun, T. Cralg Molden and Chorles H. Sanderson, "Magnetic Treatment of Water Prevents Mineral Buildup" 1997.www.Superiorawaterconditioner.Com.

M. V. and Reminick. H, "Effects of Naturally Magnetized Water On Increasing Organic Bioenergy and Function", Explore For Professional, Vol. 10, No. 4, (2001).

Ahmet Eşitken & Metin Turan, "Alternating magnetic field effects on yield and plant nutrient element composition of strawberry (Fragaria _ananassa cv. camarosa)", Acta Agric. Scand., Sect. B, Soil Plant Sci.54, 135–139, 2004.

Musa Turker, Cabir Temirci , Peyami Battal And Mehmet E. Erez, "The effects of an artificial andstatic magnetic field on plant growth, chlorophyll and phytohormone levels in maize and sunflower plants", PhytonAnn. Rei Bot. 46, 271–28, 2007.

Ashraf KOTB and A. M. Abd El AZIZ, "Scientific Investigations on The Claims of The Magnetic Water Conditioners", Annals of Faculty Engineering Hunedoara – *International Journal of Engineering*, 2013.

Samaneh Rashidi, Ali Yadollahpour, Saeed Shirali, G.Rajashekar, "Magnetized Water Treatment: Reviewing The Environmental Applications Magnetized

Water", *International Journal Of Pharmacy & Technology*, Vol. 8 IssueNo.1 11431-11441, 2016.

Yadollahpour Ali, Rashidi Sama neh, Rezaee Zohre and Jalilifarfar Mostafatafa tafa, "Magnetic Water Treatment in Environmental Management A Review of the Recent Advances and Future Perspectives", Current World Environment, Vol. 9(3), 1008-1016, 2014.

Abdilrida S. Hasaani, Zaid L. Hadi and Khalid A. Rasheed, "Experimental Study of the Interaction of Magnetic Fields with Flowing Water", International Journal of Basic and Applied Science, Vol. 03, No. 03, January 2015.

Ravindra K. Gautam, Sanjay K. Sharma,Suresh Mahiyab And Mahesh C. Chattopadhyaya, "Contamination of Heavy Metals in Aquatic Media: Transport, Toxicity and Technologies for Remediation", The Royal Society of Chemistry, 2015.

How to cite this article:

Ayat Khairi Hashim *et al*.2019, Effect of Magnetic Treatment of Water on The Reduction of Heavy Metal Concentration. *Int J Recent Sci Res.* 10(01), pp. 30517-30520. DOI: http://dx.doi.org/10.24327/ijrsr.2019.1001.3075

****