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

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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 H₂O](image)

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](image)

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...
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](image)

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 MWT 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].

(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 cm\(^{-3}\) 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 4 Magnetic Treatment Design](image)

**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, college of education for pure science – Ibn Al-Haitham by using analysis device atomic absorption flame spectrophotometer as shown in plate (3-7).
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).

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].

CONCLUSION

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

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