Al-Qadisiyah Journal of Pure Science

Volume 27 | Number 1 Article 18

4-7-2022

Physical And Chemical Changes In Water Resulting From Contamination With Heavy Metals

Mohammed Khalif Challab
The General Directorate of Education in the Holy Karbala Province, mohammadchellab@gmail.com

Al-Qadisiyah Journal of Pure Science Vol.(27) Issue (1) (2022)Chem pp. 32-44

Al-Qadisiyah Journal of Pure Science

ISSN(Printed): 1997-2490 ISSN(Online): 2411-3514

DOI: /10.29350/jops.

http://qu.edu.iq/journalsc/index.php/JOPS

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Authors Names

Mohammed Khlaif challab

Article History

Received on:17/2/2022
Revised on: 1/4/2022
Accepted on:10/4/2022
*

Keywords: Electrical shock·Qualityof Water. Nanoparticle

DOI:https://doi.org/10. 29350/ jops. 2022.27. 1.1485

Abstract

Nanoparticle in each model can be damage to water quality. This study is about nano metal in water that damaged to its quality. Metal divided to layers that electrical shock can lead to dividing of them. In different model in about temperature, Energy and different layer, quality of water be measured. Temperature has reverse relation with water quality. The best temperature to electrical shock in (-20) ˚C. electrical shock has direct effect on quality of water. In total investigation on all layers, electrical shock damaged to all layers and bridging phenomena be occurred in particle that can removed from water. With this process the quality of water will increase.

1. Introduction

One of the water pollution reasons is the particle in water that almost is metallic. Quality of fresh water be determined with external particles inhabit in fresh water. Iron, Cupper, Al and etc. observed in fresh water that is dangerous to healthy of human [1]. Layer in nanoparticle in water reported in 1988 [2]. But in mechanical investigation, this issue be present that the size of particle in important to separation of this materials. Layers of particles are important to refinery process in water [3]. Nonmetal particle polluted the water and this issue damaged to water quality. But the resistance of

The General Directorate of Education in the Holy Karbala Province

Email: mohammadchellab@gmail.com

these particles, out of the Nano discussion, is importance parameters in absorbing of them. Elastic property did not relate to magnet property but will divide to electrical process in water refinery [4]. Glare related to naming the layer of materials. These materials may be metallic or nonmetallic. All of Nano material inhabited in water can be identified with electrical process in water refinery [5]. Quality of water depended to external particles in water. But previous researches did not attended to this issue. Relation between salinity of water with cupper particles be reported in 2007 [6]. This research shown that fresh water related to convent of its. Effect of iron Filings on human healthy be reported in 1998 [7]. This issue is suitable in some cases, especially to women. Iron has especially effect on healthy that is related to iron ion. This is reason that iron be absorbed in body. Reported that electrical shock to nanoparticle can be done with electricity [8]. With controlled electrical shock, it can be divided the monometallic particles. But this process related to property of Nano metal. Layers and elastic property is importance to ability of dividing the particles [9]. Water quality has no specified scale that in researches sis not absorbed the significant parameter [10].

In this research, with electrical shocking to water contained metallic particles, quality of water determined and property of particles changed that its effect on water quality investigated.

In this research, the water of Diwaniyah river has been studied. The Al-Diwanah River is a tributary of the Al-Hillah River, which flows through the cities of Diwaniyah, Al-Sadr, Al-Hamza, and Al-Rumaitha

2. Numerical Modeling

Simulation the process of electrical shock to water polluted with heavy metal be done.

2.1. Modeling strategy

Kind of the analysis in FEM to this problem is electromagnetic and CFD model and should be determine in step module. Be mention that this problem is combination of the dividing and electrical shock that electrical shock doing is constant temperature and dividing load begin in alternative temperature. First layer has thickness and should be model as solid, but middle layers should have small thickness that mentioned in Table (1). For Al layers the isotropic elastic-plastic properties of Al were modeled with using the isotropic plasticity model in Abaqus. In second step property should be determine that are written on basis on standards.

Table (1): geometric and mechanical property of metallic nanoparticles

Grade	Sub	Metal Type	Metal Thickness (nm)	Fibre layer (nm)	Pregreg orientation in each fibre layer	Characteristics
Glare1	-	7475-T761	0.3-0.4	0.266	0/0	Dividing , strength, yield stress
Glare 2	Glare 2A	2024-T3	0.2-0.5	0.266	0/0	Dividing , strength
	Glare2B	2024-T3	0.2-05	0.266	90/90	Dividing , strength
Glare 3	-	2024-T3	0.2-0.5	0.266	0/90	Dividing , electrical shock

Glare 4	Glare 4A	2024-T3	0.2-0.5	0.266	0/90/0	Dividing , strength in 0 direction
	Glare 4B	2024-T3	0.2-0.5	0.266	90/0/90	Dividing , strength in 90 direction
Glare 5	_	2024-T3	0.2-0.5	0.266	0/90/90/0	Electrical shock , shear, off axis properties
Glare 6	Glare 6A	2024-T3	0.2-0.5	0.266	+45/-45	Shear, off-axis properties
	Glare 6B	2024-T3	0.2-0.5	0.266	-45/+45	Shear, off-axis properties

In this case damage property is important and determine level of adhesive to keep layers. Doing stress to layers is cause of the damage in cohesive and unlock the layers. Therefore the damage property as hashin, damage, energy level and,….. be determine in property module. Table (2) show the damage property that be determine in FEM modeling.

Temperature between (20)˚C to (-20)˚C as show at fig 1 and reverse again has constant slope. If time of the dividing action is (60) s, the fig 1 show the changing temperature in during the alternative load.

2.2.Model Validation

Glare 4 2/1 (0.3) with a thickness of (0.975) nm divided to 2 type. In first type the electrical shock energy is (27) J and in second type is (54) J of electrical shock . In the case of the appearance of the first signs left 01 little resistance will be traumatic. Little resistance layer, creating tiny cracks and the cracks after 25700 cycles, their appearance is displayed. After applying the Fig. below shows the electrical shock and before the start of cycle times. Failure piece is incredible. The results show the number 28000. The difference is in the acceptable range. Disruption and downtime caused time particle after 55,000 cycles. Tests show the number 57000. After 55,000 cycles shows once spoiled pieces.

In model 2, cracks appeared after 18,000 cycles and up to 60,000 particles will be completely broken. It shows a high plasticity. Experiments show that after cracks appeared, but after 18,000 cycles 61200 breaks. In this case, the best and most accurate answer is obtained.

Fig. (2) show the experimental system that be doing the complex electrical shock -dividing that using from experimental date be validation simulation in FEM method. Date show the suitable result and validity in extraction data.

3 . Numerical Analysis

FEM model in order to analysis the electrical shock -dividing complex in different and alternative temperature be done. Validation of simulation described in previous section. Table (2) shows the entrance property. Simulation be done at three temperature. (20 & 0 & -20) ˚C for electrical shock or. but glare temperature on basis on Fig. (1) be change isotropic elastic property fir the Al 2024-T3 are: Young modulus E=73800 MPa and Poisson ratio is 0.33. the unidirectional layer heavy metal exhibits transversely isotropic behavior. The corresponding elastic properties, ultimate stresses and fracture energies for the layer are given in Table (2). The material property of the adhesive used in FEM analysis are shown too.

Table (2) : Material Property to FEM

Material Properties	Value
Young modulus of elastic [GPa]	73.1
Poisson ratio	0.33
Initial yield stress [Mpa]	345
Ultimate tensile strength [MPa]	483
Thermal conductivity [$Wm^{-1}K^{-1}$]	121
Coefficient of thermal expansion [$° C^{-1}$]	$24.7*10^{-6}$
Density [kgm^{-3}]	2770
Specific heat capacity [$JK^{-1}g° C^{-1}$]	875
Solidus [$° C^{-1}$]	502
Liquidus [$° C^{-1}$]	638
Plastic strain	0.2
E_{11} [GPa]	55
E_{22} [GPa]	9.5
G_{12} [GPa]	5.5
G_{23} [GPa]	3
ν_{12}	0.33
ν_{23}	0.33

The average thicknesses of different layers were measured using optical micrographs. For GLARE 4-3/2 the average layer thickness was (0.304) nm for the Aluminum and (0.458) nm for the heavy metals. The layers were thicker GLARE 5-2/1: (0.489) nm for the Aluminum and (0.584) nm for the heavy metal. Thus, the total laminate thicknesses were (1.828) nm and (1.562) nm, respectively for GLARE

4-3/2 and GLARE 5-2/1. On the other hand, the average thicknesses of the aluminum 2024-T3 particles was (1.60) nm.

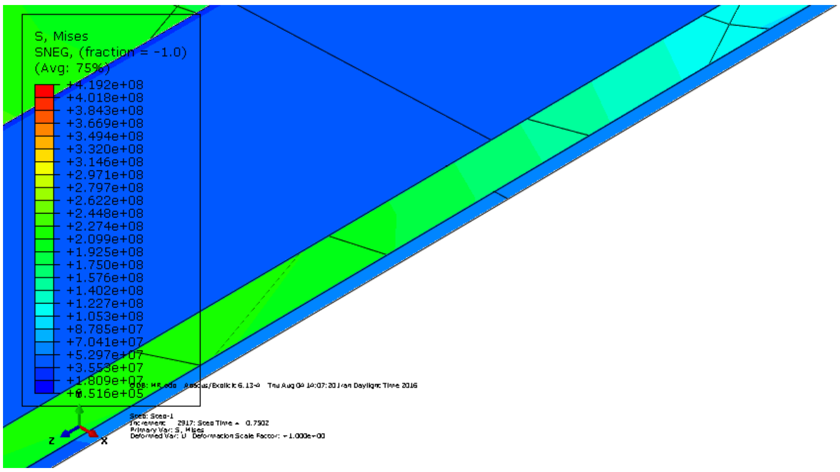

Fig.(1): Bridging in heavy metal layers

Fig.(1) shows browsing. Photo taken in view and it is hard to detect due to the small thickness of the particles. Middle notes are green and bear the main recipient of the load. Two upper and lower particles are available in blue in the shower after browsing role in the decision not load.

The Fig. above is facing away from the plate at the time of loading. Started out as a dot in the middle distance and the stress concentration is specified. the first to be fine and leave the stress concentration increases with increasing particle continues to complete failure.

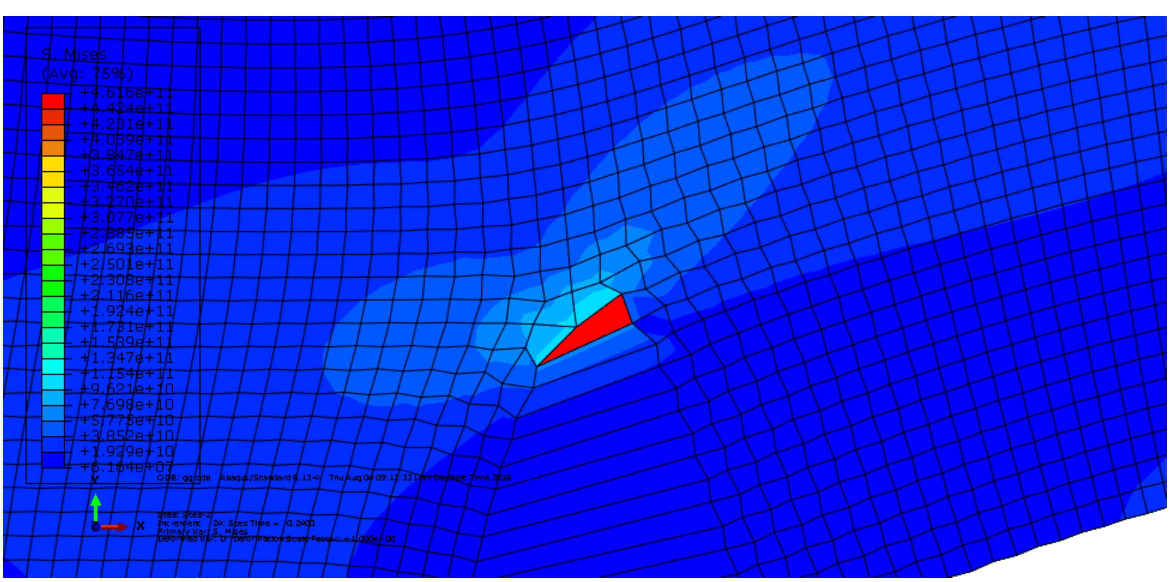

Fig.(2): Find the initial crack

Beginning leave here well known. German Bottom sharply drawn and are tearing. A square element clearly shows crack initiation. The following graph shows the tension between the two elements. One tip to leave and the other a normal element. However, due to the large number of cycles of this graph clearly not well with the stress concentration factor cannot be identified. The development of stress concentration is well understood in the next graph.

4. Results and discussion

Water hardness is related to cations such as Magnesium, Calcium, Strontium, Iron, Aluminum, Manganese, Copper, and anions such as Bicarbonate, Carbonate, Chloride, Sulfate, Silicate and Nitrate in the water. The difficulty is expressed as temporary and permanent:

The sum of those two parameters is defined as the total hardness. The hardness is in mg / lit of Calcium Carbonate.

Due to its amount, the water is divided into two categories: soft water, almost hard water, hard water and very hard water.

Electrical shock contact with glare has so short time and this issue because that electrical shock or temperature effect on glare damage is significant. The date show the very small effect on cycle life that in frigid electrical shock or be cause to compression the molecular in middle of glare and be increase the dividing life a little. The Table (3) show the result.

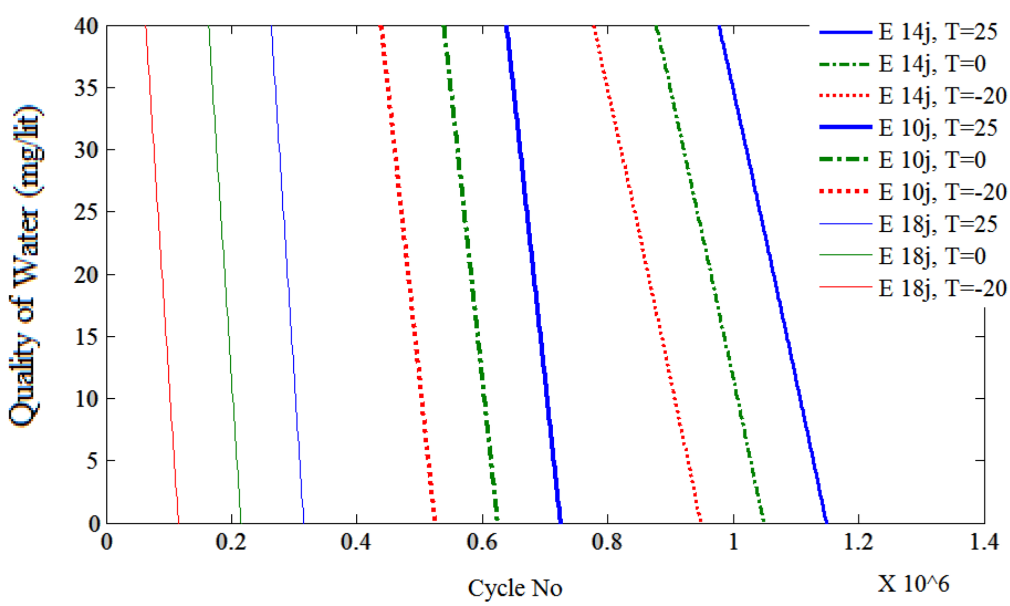

Fig.(3): Effect the electrical shock on water quality in G 5 2/1

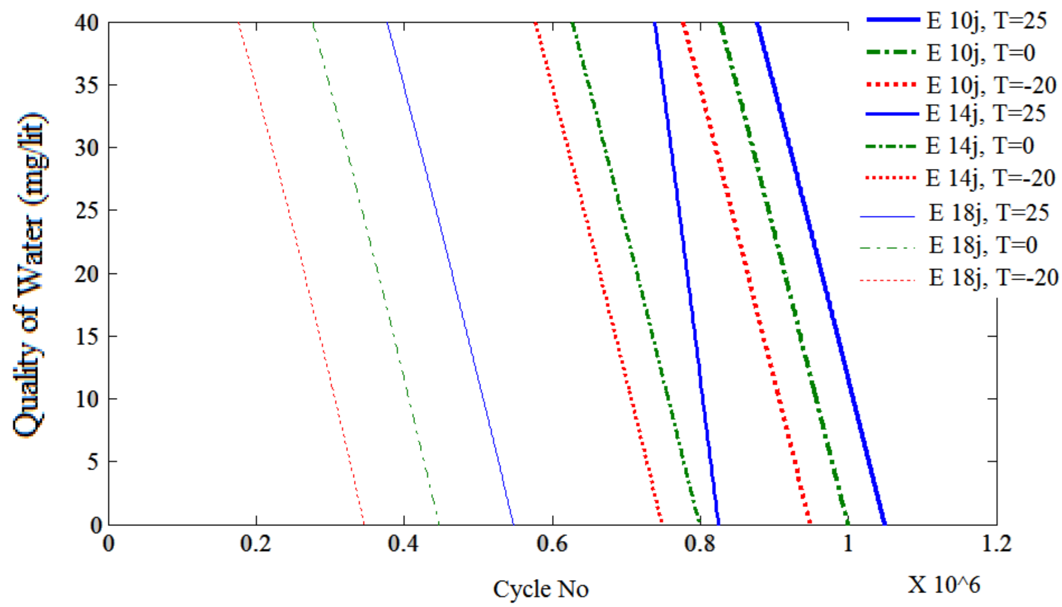

Fig.(4): Effect the electrical shock on water quality in G 4 3/2

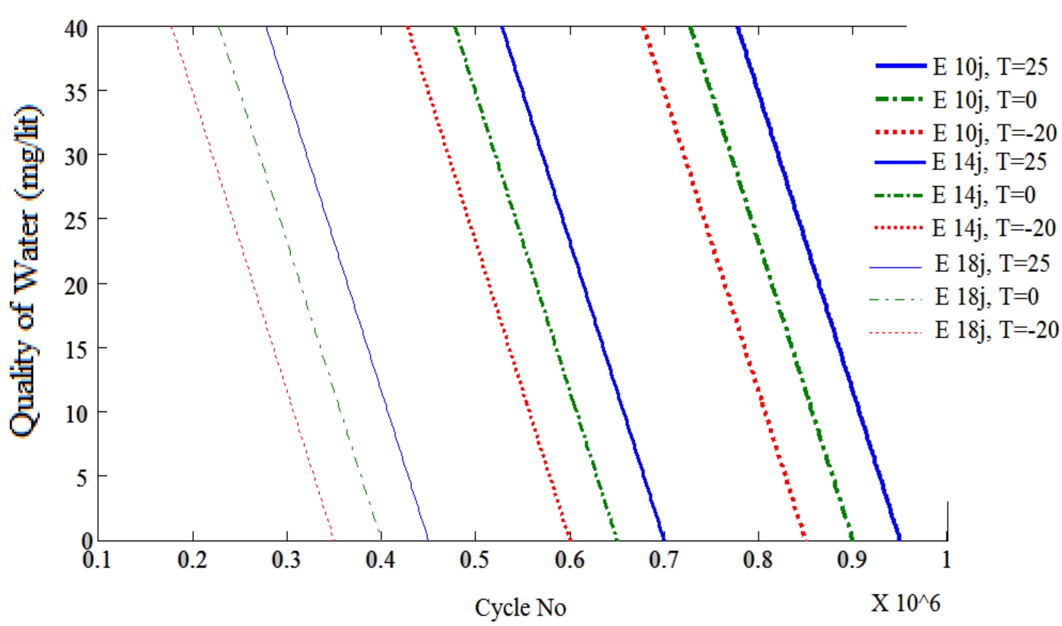

Fig.(5): Effect the electrical shock on water quality in G 4a 2/1

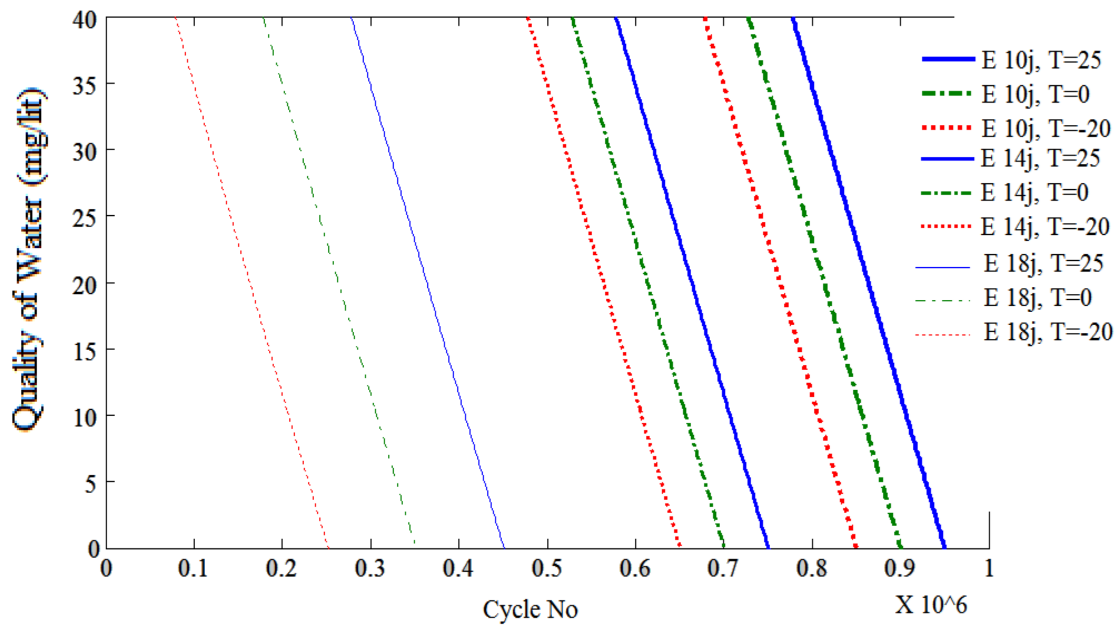

Fig.(6): Effect the electrical shock on water quality in G 4b 2/1

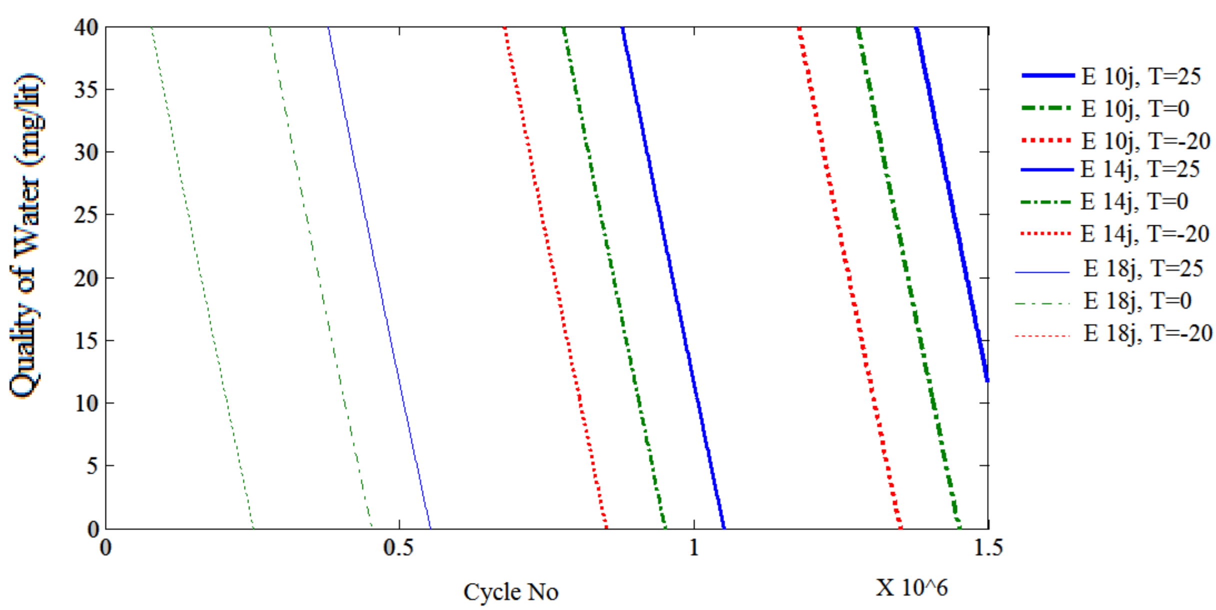

Fig.(7): Effect the electrical shock on water quality in G 5 3/2

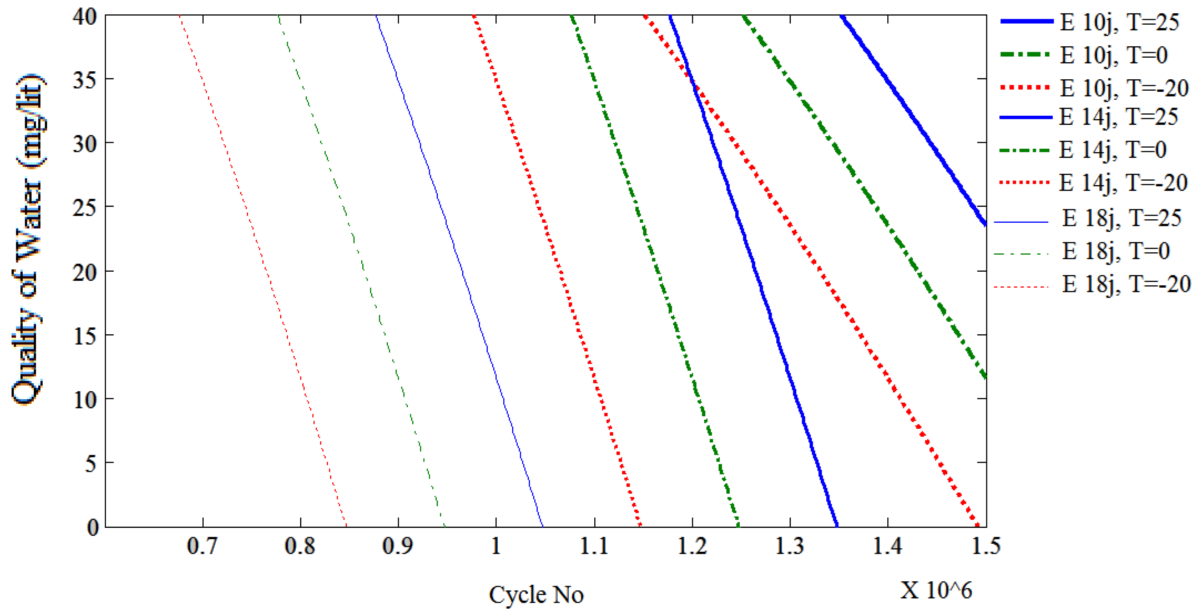

Fig.(8): Effect the electrical shock on water quality in G 2a 2/1

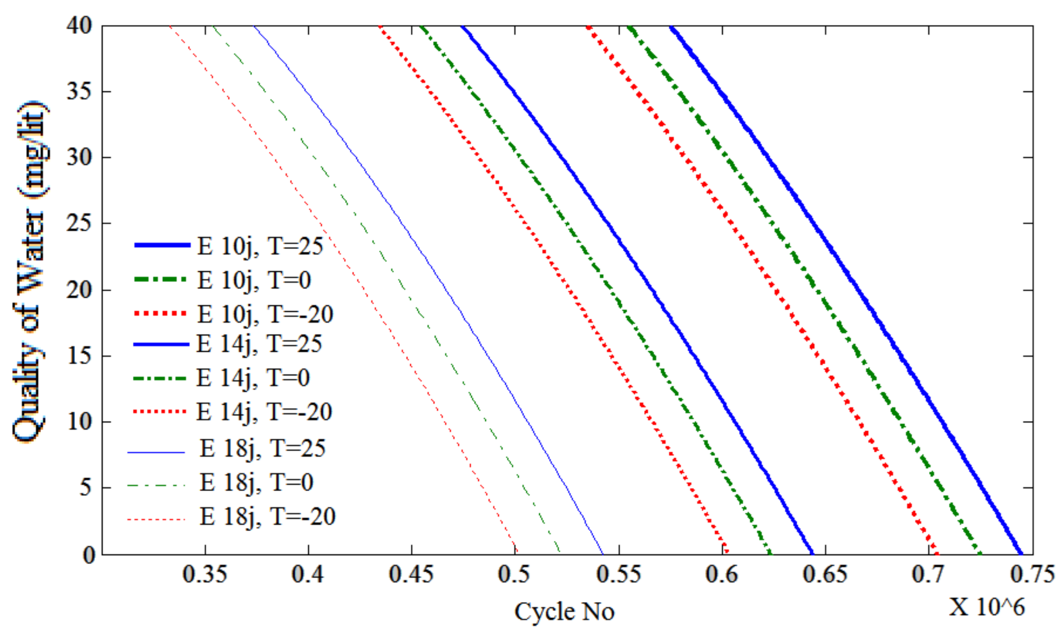

Fig.(9): Effect the electrical shock on water quality in G 2b 2/1

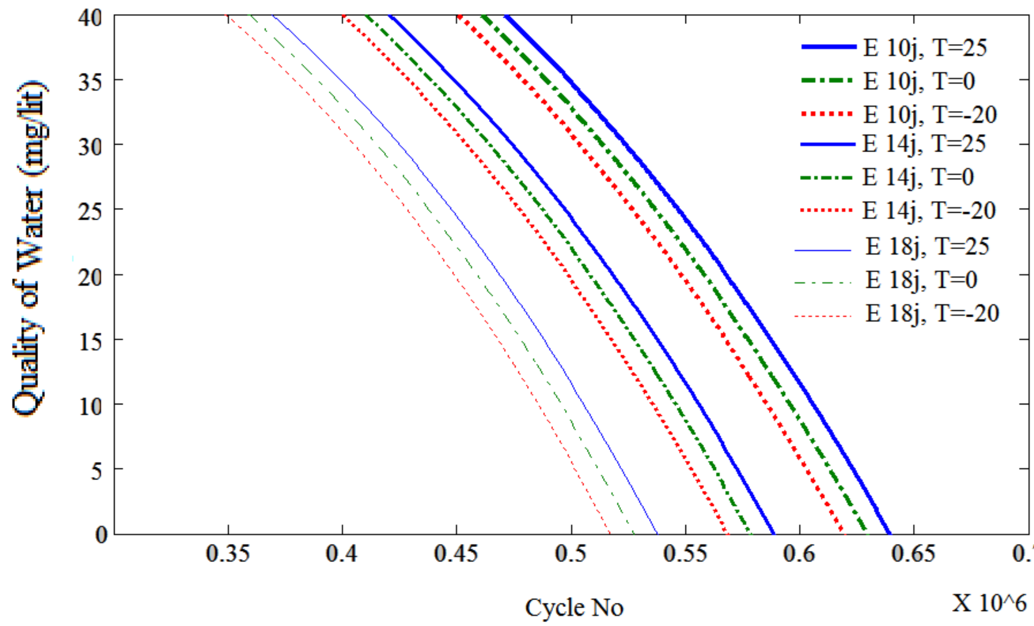

Fig.(10): Effect the electrical shock on water quality in G 3 2/1

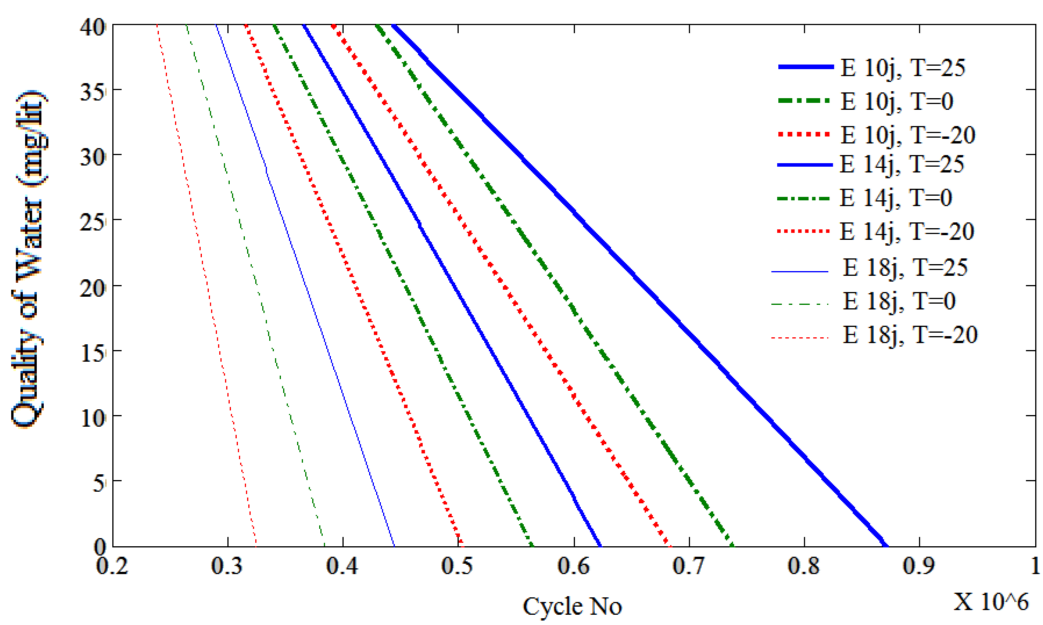

Fig.(11): Effect the electrical shock on water quality in G 4a 3/2.

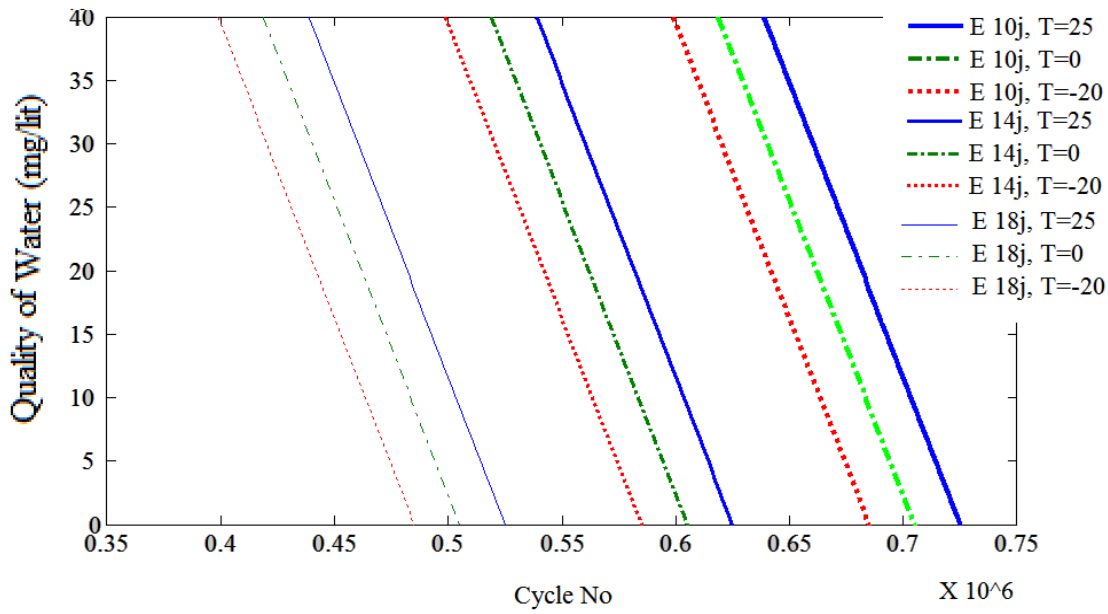

Fig.(12): Effect the electrical shock on water quality in G 3 3/2

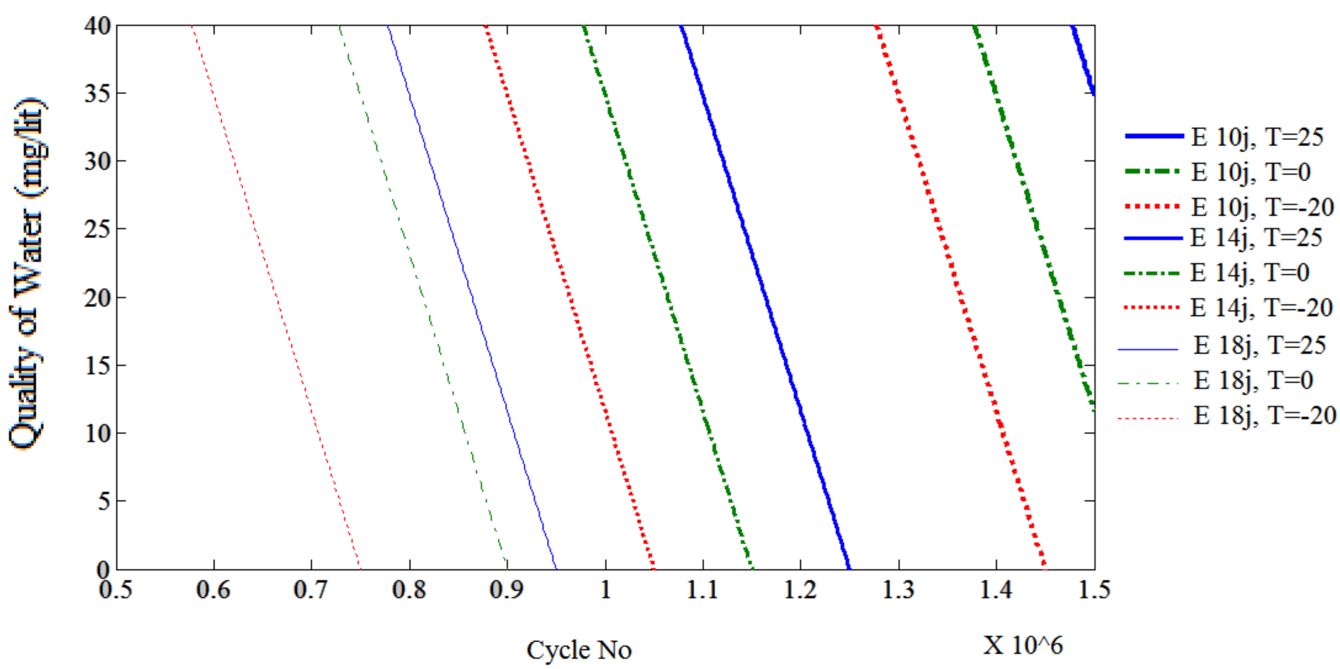

Fig.(13): Effect the electrical shock on water quality in G 2a 3/2

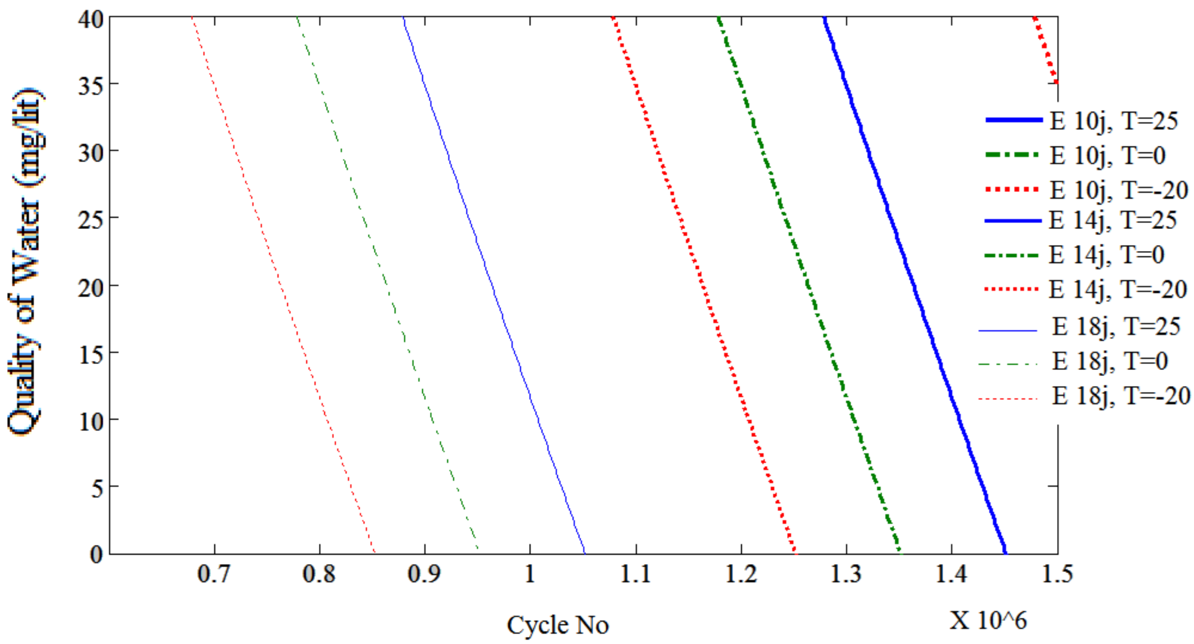

Fig.(14): Effect the electrical shock on water quality in G 2b 3/2

Conclusion

Electric shock to heavy metal particles in water firstly results in damage between the layers The amount of damage to each layer is approximately equal. And keep it in soft water. The general purpose is for the water in the soft range to have a particle concentration below 100 (PPM) Therefore, it is possible to eliminate the negative effect of particles in water. Lowering temperature and increasing shock energy can help to improve water quality By examining individual layers, it is concluded that better quality water can be hoped for if water is treated at low temperature and high shock.

References

1. Abdel-Satar, A. M., Ali, M. H., & Goher, M. E. Indices of water quality and metal pollution of Nile River, Egypt. *The Egyptian Journal of Aquatic Research*, *43*(1), 21-29, (2017).

2. Zhu, D., Wu, S., & Lu, N. Evaluation of Nutrient and Heavy Metal Pollution in Maozhou River in Shenzhen City. In *IOP Conference Series: Earth and Environmental Science* (Vol. 170, No. 3, p. 032156), (2018, July). IOP Publishing.

3. Messersmith, P. B., & Lee, H. *U.S. Patent No. 10,093,557*, (2018). Washington, DC: U.S. Patent and Trademark Office.

4. Tanjung, R. H. R., &Hamuna, B. Assessment of water quality and pollution index in coastal waters of Mimika, Indonesia. *Journal of Ecological Engineering*, *20*(2), (2019).

5. O'Mara, K., Miskiewicz, A., & Wong, M. Y. Estuarine characteristics, water quality and heavy metal contamination as determinants of fish species composition in intermittently open estuaries. *Marine and Freshwater Research*, *68*(5), 941-953, (2017).

6. Tanjung, R. H. R., &Hamuna, B. Assessment of water quality and pollution index in coastal waters of Mimika, Indonesia. *Journal of Ecological Engineering*, *20*(2), (2019).

7. Song, J., Duan, X., Han, X., Li, Y., Li, Y., & He, D. The accumulation and redistribution of heavy metals in the water-level fluctuation zone of the Nuozhadu Reservoir, Upper Mekong. *Catena*, *172*, 335-344, (2019).

8. Odobašić, A., Šestan, I., &Begić, S. Biosensors for Determination of Heavy Metals in Waters. In *Environmental Biosensors*. IntechOpen, (2019).

9. Shonouda, M. L., El-Samad, L. M., Mokhamer, H., & Toto, N. Use of oxidative stress and genotoxic biomarkers of aquatic beetles Anaceanaglobulus (Coleoptera: Hydrophilidae) as biomonitors of water pollution. *J Entomol*, *13*, 122-131, (2016).

10. Capillo, G., Silvestro, S., Sanfilippo, M., Fiorino, E., Giangrosso, G., Ferrantelli, V., ... &Faggio, C. Assessment of electrolytes and metals profile of the Faro Lake (Capo Peloro Lagoon, Sicily, Italy) and its electrical shock on Mytilusgalloprovincialis. *Chemistry & biodiversity*, *15*(5), 1800044, (2018).