

## The Effect of Using Nano Colloidal Silver on pH and Turbidity of Water Samples from Tigris River / Karada

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### Abstract

Many scientific investigations carried out on using nano silver colloidal in purification drinking water from bacteria and its effect on pH balance and turbidity were established. Two stages accomplished in this project , first stage include preparation of colloidal silver using Arc discharged method (ADT) with characterization properties and river water samples treatment with colloidal silver in volume ratio (NAg/water ) ((0.1 – 8 )/100)ml with pH and turbidity measurement. The second stage include select the best results from first stage of NAg ratio , pH ,turbidity and study microbiological activity for purification water sample set process and determine the variations in pH and turbidity measurements . Results show good activity of NAg ratio for purification Tigris` s river samples with acceptable pH balance at volume ratio ((0.7 – 0.8 ) /100 ) ml

**Key wards:** Nano Colloidal, Silver Turbidity, pH and Water

### تأثير استخدام عالق الفضة النانوي على الاس الحامضي و الكدرة لنماذج من مياه نهر دجلة/ الكرادة

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### الخلاصة

جرت العديد من البحوث العلمية في مجال استخدام عالق الفضة النانوي في تعقيم مياه الشرب من البكتريا و تأثيرها على كل من توازن قيمة الاس الحامضي و الكدرة ، تضمن البحث مرحلتين ; المرحلة الاولى شملت تحضير عالق الفضة النانوي بتقنية التفريغ الكهربائي (ADT) و توصيف العالق و استخدامه في معالجة نماذج من مياه النهر بنسب حجمية ( عالق الفضة / مياه النهر ) ( 0.1 – 8 ) / 100 مل و قياس الاس الحامضي و الكدرة . و تضمنت المرحلة الثانية اختيار افضل النتائج من المرحلة الاولى بما يتعلق بقيم pH و الكدرة إضافة الى التأثير المايكروبيولوجي في تعقيم نماذج المياه و تحديد التغيير الحاصل في قيم pH و الكدرة . أظهرت النتائج الفعالية الايجابية في استخدام عالق الفضة النانوي في تعقيم مياه من نهر دجلة على توازن قيم الاس الحامضي و باعتماد قيم النسب الحجمية ( 0.7 – 0.8 ) / 100 مل .

**الكلمات المفتاحية:** عالق الفضة النانوي، الكدرة، الاس الهيدروجيني والماء.

## Introduction

Silver has been known since antiquary for its many properties useful to humans. It is however; an element to many faces. It is used as a precious commodity in currencies, highest electrical conductivity of any element. Its chemical traits allow uses ranging from dental alloys to explosives. Claims of medicinal properties have followed silver since the time of Hippocrates for example, in treating wound, and burns for its broad- spectrum toxicity to bacteria , water purification and perhaps to fungus and viruses as well as its reputation of limited toxicity to humans (Gibbons and Warnar., 2005, Lubick 2008 and Vermealen *et al.* , 2007).

Commercial products that generate silver ions or contain nano silver are one of the most rapidly growing classes of nano particles most of the emerging products exposit silvers effectiveness in killing wide range of bacteria including some of the strains that have proven resistance to modern antibiotic methods of manipulating silver so that it can be incorporated into other mediums (fluids , plastics , surfaces) (Heing 2007, Morones 2005 , Kim 2007 and Elechiquerra, 2005). pH is short for potential hydrogen which is the standard scientific measure for levels of acidity or alkalinity in organic material . pH is reference balance in relation to balance of :-

- 1- Soil in agriculture
- 2-The pH balance of aquarium water.
- 3-Fish and Marian species. The pH balance of our body fluids and is corridor measurement of our general of health (Sanudo –Wilhelmy and Gill 1992, Vermerie *et al.*, 1997) in this research ; we study pH and turbidity of river water treated with volume ratios of (NAg) for water purification .

## Materials and Methods

Material required are silver wire with purities (99.99) and DC pulsar power supply with servo control, double deionized distilled water, (DDDW). Silver colloidal obtained by using Arc-discharge method(Tien, *et al.*, 2007) by so called sacrificial method with range of particle size (60-130)nm using AFM (AA3000 spm console microscope) ,DDDW have pH value (6.2) using lavibont , checkit direct (dorine+pH ) meter and concentration (11.8) ppm using (AAS phoenix -986 ) and for turbidity, measurement we used two types (turbidity , HACH and lovibond ) .Toevaluate the antimicrobial efficiency for water samples; the following steps are followed: water samples collected and prepared from Tigris river/Karrada city tap water station as shown in Fig.(1). Samples were treated with colloidal silver solutions with volume ratios (N<sub>Ag</sub>/water) (0.1-8)ml/100ml and antimicrobial effect achieved by standard methods for water inspection which contained the use of nutrient agar for aerobic total count of bacteria inspection and Morones broth for coliform and fecal coliform with total count, the antimicrobial samples illustrated in picture (1) .

## Results and Discussion

Evaluation of antimicrobial activity of colloidal silver technique was achieved in lab. using agar as nutrient while pH and turbidity measurement where achieved in water station site. Table (1) represent pH value of colloidal silver with preparation time (5-45) minute. It seems pH value changed proportionally with time related to more silver ions particles produced during preparation method .

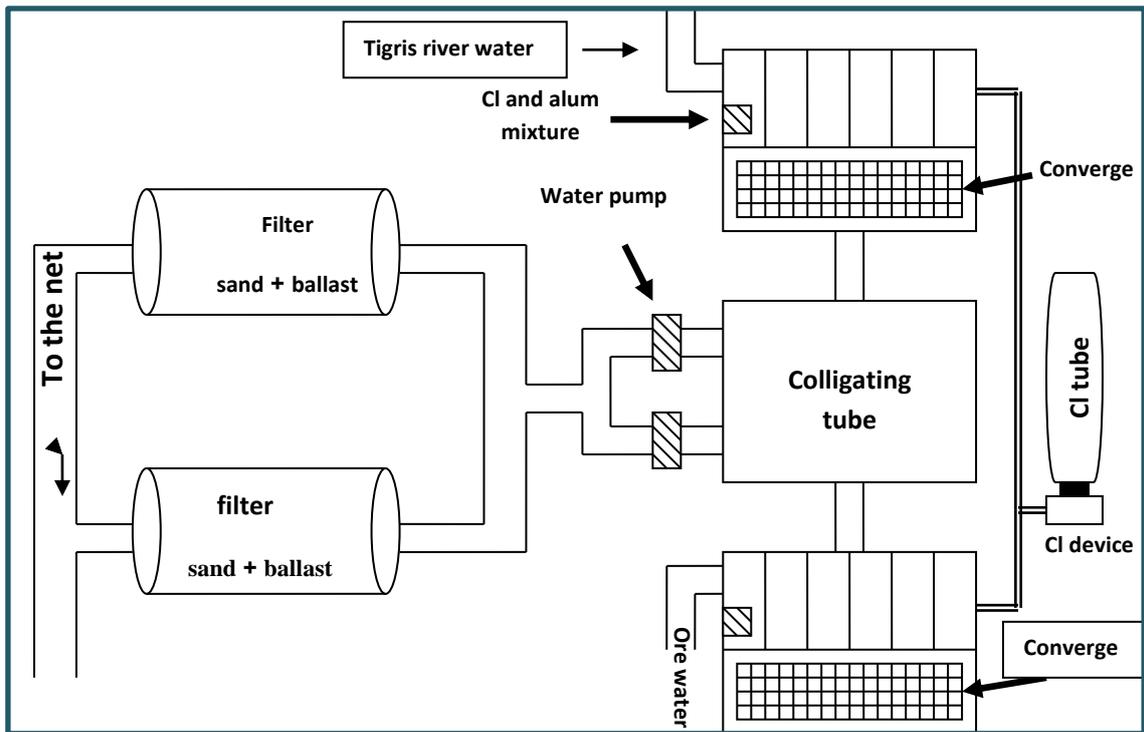
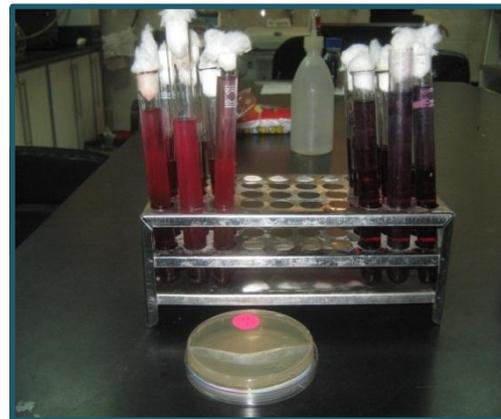
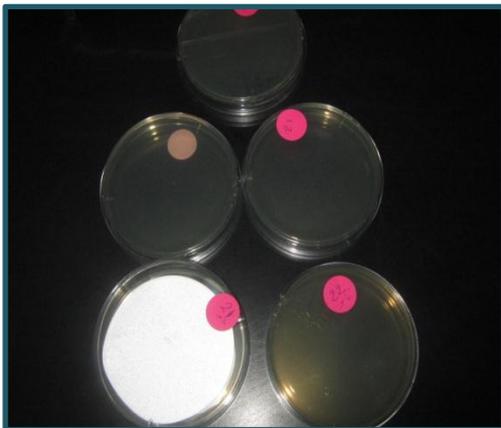


Figure (1) Scheme Diagram of Baghdad/Karada City Tap Water Supply Station System



Picture (1) Antimicrobial Samples

The effect of using filter paper to colloidal silver solution, with and without river water samples was also studied. Table (2) show the reduction of pH value of NAg with one, two filter paper, three times of filtrations process and with using double filter paper where pH values decreased each time to reach (7.4) (Vermerie *et al.*,1997).

The purpose of this previous process is trying to get an acceptable pH value of (NAg) that at the range of Iraq standard drinking water (S:417:2009, ics:13060

020iq .2009/417) which is about (6.5 -8.5 ) Turbidity and pH values of Tigris river water are changed every day and every hour. Working in Karada station site for water supply from Tigris river samples treated with colloidal silver have pH, 7-7.5 and turbidity of river water samples were 8-63NTU; after filtration become 6-32 NTU while pH of river water samples is out of range . Table (3) show results of NAg / water treatment using volume ratios (0.1-5 ml) /100ml). According to pH value , once can

cleared that pH and turbidity changed with each addition amount of NAg . Also using NAg solution in 0.7 ml gives the best value of pH and turbidity for water after sedimentation of river water more than 10 minute. For recheck the last result , table (4) show the changes in pH and turbidity value for water samples have been left for 10 minute and filtered using filter paper then treated with NAg/water ratio (0.7-0.9)ml /100ml (Smith and Flegal., 1993).pH values are well acceptable according to Iraqi standard certification in addition to volume ratio 0.7/100 ml as shown in table (4) .Table(5) show good antimicrobological activity can be obtained using NAg solution technique with raising NAg volume ratio to 7 and 8 ml /1 L . Effect of filtration process for treated water caused the reduction of

total account to (56) and zero to coliform and fecal coliform bacteria with raising colloidal nano silver volume ratios (Beden *et al.*,2012)

### Conclusions

From this research, colloidal silver solution has been successfully used as microbiological water agent and proved its activity at 11.3 ppm concentration (0.7-0.8)ml/1L volume ratios with acceptable pH values . Turbidity values show high numbers that are related to the absence of high regular treatment process of hardness and salts to river water samples. Finally ; the obtained results may open the way to new approach in solving many environmental problems such as water treatment with new advanced technology process parallel with nanotechnology technique

Table (1) pH Value of Colloidal Silver Suspension with Preparation Time.

pH	Minute
6.1	5
8.8	10
9.3	15
9.6	20
9.65	25
9.8	30
9.82	35
9.9	40
10.0	45

Table (2) Colloidal Silver pH Value with Filtration Process (Filter Paper)

No. of times	pH
0	10.0
1 time	9.5
2 time	9.3
3 time	8.6
4 time	8.2
Double filter paper one time	7.4

Table (3) pH , and Turbidity Values of Water Samples 100 ml Water from River Treated

NAg(ml)	pH	Turb. NTU.
0.1	7.47	23.6
0.2	7.45	19.5
0.3	7.47	22.0
0.4	7.5	20.3
0.5	7.42	20.7
0.6	7.49	21.4
0.7	7.54	7.77
0.8	7.47	13.4
0.9	7.4	16.9
1 ml	7.5	18.7
2ml	7.44	20.3
3ml	7.5	26.7
4 ml	7.43	23.6
5 ml	7.5	25.7

Table (4) pH and Turbidity Values Using Colloidal Silver in Ratios 0.7-0.9 ml/100 ml Water

NAg(ml)	pH	Turb. NTU
0.7	8.50	11.2
0.7	14.4	17.7
0.8	13.3	18.1
0.8	13.6	15.2
0.9	12.0	19.6
0.9	12	15.0

Table(5) Microbiological Tests Results of Treated Water Samples with and without Filtration

Samples	Total count	Coliform	Fecal Coliform
River Water	TNTC	30	+ve
Before filtration normal 7ml Ag	TNTC	22	+ve
After filtration 7 ml Ag	TNTC	0.0	0.0
After filtration 7.5 ml Ag	70	0.0	0.0
Before filtration 8ml AG	TNTC	16	+ve
After filtration 8 ml Ag	53	0.0	0.0

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