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Silver effect on water purification and sterilization

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Abstracts :-

Colloidal Silver Filters are simple devices used for home water treatment on the basis of physical treatment that do not require power supply. Colloidal Silver Filters utilization a vessel, mud candle, or nipping made of pored ceramic material like to conventional ceramic nominee.
However in colloidally silver candidate , colloidal silver is use to promote the hindering microorganism, bacteria and another types of microbes.
The filter assembly contained two vessel : the upper vessel carry the ceramic plated with colloidally silver , filters the water , and murder the bacteria and the microorganism, and the lower vessel saves treated water.
Colloidal silver filters removes turbidity and pathogens from drinking water.
Colloidal silver candidate can be built with locally prepared materials , that can contribute to expanding of local trade.

keywords : Silver, purification , nominee.

Introduction :-

Domestically output ceramics have been utilization to filter water for hundreds of years. Water is decanted into a porous ceramic filter container or into a container containing a ceramic candle or tweak that filters the water. This filtered water is gathering in other vessel(1a). The filter elimination turbidity, traps and kills pathogens from drinking water. Also see ceramic candle filter to improve the ceramic candle filter, colloidal silver can be added. Colloidal silver helps stop pathogens and stop the growth of bacteria within the filter itself(1a). This benefactress shapes of ceramic filters are called colloidal silver filters. Colloidal silver filters were evolved at the

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Central American Institute of Industrial Research in Guatemala in 1981 and are vastly promotion today . Currently, the most widely used ceramic filter is the Colloidal Silver Ceramic Filters for Peace, which take the form of a flowerpot .

See **(Figure 1).**

(Figure 1)

This ceramic filters composed a group of two vessel .
Upper unit composed of a ceramic unit that filters water , and the bottom unit gather safe filtered water.

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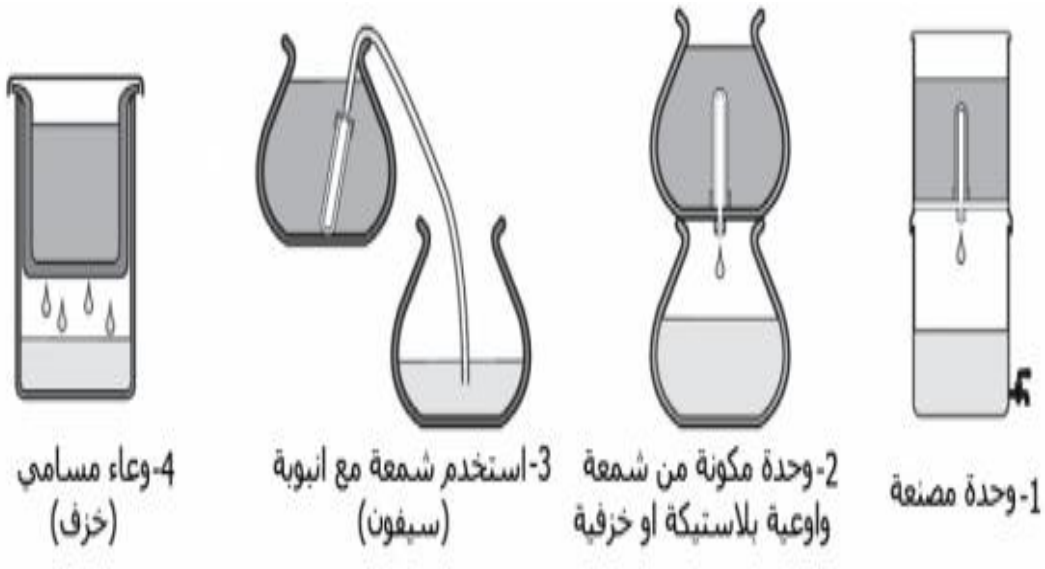
The tap device allows users to pull water for consuming ,while block re-pollution by contact with hands or other matter that can carry bacteria. Porous ceramic devices can be either a tweak , a candle or two or a tureen . Through use, small colloidal silver are hanging in the liquid that acts as a disinfectant to inhibit bacterial growth in the ceramic filter and to promote breakdown of bacteria inside the refinery (filter)(1b) .Colloidal silver is either addendum to the mud mixture before ignition or fertilized on a ceramic vessel after combustion (1a) (19). See **(Figure 2)**



(Figure 2)

How it works?

Diseases and hanging matter are elimination from the water during physical operations like absorption and mechanical processes .

Colloidalilly silver decomposition pathogen causing cell walls , lead them to die(1b).

Filtering is a simple procedure.

In the first, the filter needs pure water to be cleaned and leave it a side to dry normally.

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Thereafter , the candidate must be gathering and the upper unit must be bellyful of water.
Thereafter one waits for the water to go during the filter for the first period . For safety reasons, filtered water should not be consumed for the first time.
Thereafter , the candidate can be packaged and the filtered water in the nether bowl is now available to drink. To prevention occlusion, water with a high turbid (levels greater than 50 NFUs) must first be filtered (through a cloth) or precipitated before use.
The filter punnet should be cleaned regularly with brush or a fine cloth to sweep any cumulative material .
It is good idea that the filter punnet tweak , or candle be exchange every 1-2 years(1a).
Cleaning prevents biofilm formation and protects against invisible cleft that may develop over time. Any cleft will reduce the efficacy as water may pass unfiltered through the ceramic pores (1a).
Nevertheless, make certain not to elimination all of the silver when using the brush to immaculate.

Treatment efficiency and effectiveness:-

Candle nominee and cylinder nominee usually have a bottom contact surface for the water and thus the nominee daily output less treat water per day than the bowl nominee.
Nevertheless, the active curing average relies on the design.
Model bowl nominee can product up to 1-3 litter/houer whilst a candle filter only product 0.1 to 1 L / H (1)(2).
The activity of ceramic nominee at get out viruses, bacteria and relies on the pore size of the ceramic material and the output goodness of the nominee unity .
Generality of the nominee are efficient at elimination most of the primary and large microorganism organisms and parasitic worms , not the smallest viral organism(3).

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Experiences have shown that although most bacteria are elimination mechanically during small filter pore, colloidal silver is indispensable to disable approximately 100% of microorganism(4).

Activity of colloidal silver on viruses is not good known ,but it is rated to be less because of the small size of viruses comparison of the silver molecules . Solids are elimination efficiently by material filtration. The smell , tint and savor of the filtered water are also mend by the colloidal silver filter.

Iron is partially elimination but other melted chemical impure are not elimination .

The effectiveness of colloidal silver nominee has been proof in several studies, where it has been documented to reduce the incidence of diarrheal diseases among users(3)(5).

Water purification using silver:-

Electrolytically melted silver has been utilization as a water purification worker, such as , drinking water supplies from Russia's Mir-Urbital station and the internationalist space station(6).

Many new hospitals use copper and silver filters to purify hot water and prevent infection with Legionella and methicillin-resistant Staphylococcus aureus(7).

The WHO includes the use of colloidal silver due to the electrolysis of silver electrodes in water, and colloidal silver in water nominee as two of the Several methods of sterilizing water and providing secure drinking water in development country(8)[29].

Along these lines, a silver-coated filtration system created by Ron Rivera of Potters for Peace in development country was used to sterilize water (in this application silver was used to prevent the growth of microbes on the filter substrates, to prevention occlusion and not to directly sterilize the filtered water(9)(10)(11).

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Machinery of Action :-

Silver and most silver compounds are effective in small amounts and are toxic to bacteria, algae, and fungi in the laboratory.
Among the elements that have this effect, silver is the least toxic to humans.
This antibacterial effect of silver depends on the ionization of silver(12).
The efficacy of silver compounds as a disinfectant is based on the ability of the biologically active silver ion (Ag +) to cause irreversible damage to the essential enzyme systems in pathogen cell membranes(12).
It has long been known that the antibacterial effect of silver is strengthened by the existence of an electric field.
By enforcement an electric current through the silver electrodes, this strengthened the antibacterial effect of the anode, and this is return to the exit of silver particles into the bacterial medium (13).
The antibacterial effect of the electrodes painted with silver nano composites greatly improved in the presence of an electric field (14).
When silver is used as a local disinfectant, it may become incorporated into the bacteria that kill it, so the killed bacteria may be a source of silver that can kill more bacteria (17).
Colloidal Silver Filters are simple devices used for home water treatment on the basis of physical treatment that do not require power supply. Colloidal Silver Filters utilize mud candle, bowl, or cylinder made of a pored ceramic material similar to conventional ceramic nominee. But in colloidal silver filters, colloidally silver is used to promote obstruction of microorganism and other types of microbe.

The filter assembly consists of two containers:

the upper or the top unity carry the ceramic plated with colloidal silver , filters the water , and murder the microorganisms , and the lower or bottom unity stocks or stores the cure water . Colloidal Silver Filters remove pathogens and turbidity from drinking water. They can be build

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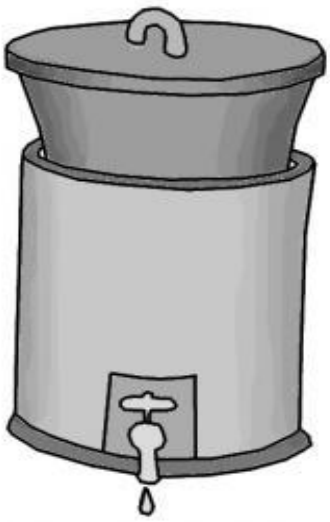

(Figure 3)

up with locally ready materials that can contribute to the expansion of local trade . See **(Figure 3)**

Advantages :-

1- High removal of bacteria and protozoa ; moderate virus removal.
2- Easy to install , run and maintain
3- Local output can create chance for little businesses .
4- Abstraction turbid .
5- The water tastes and looks good .
6- Easiness to use and conservation .
7- Movable container.

Disadvantage :-

1- Does not remove chemical contamination (such as organic matter, arsenic, and fluoride) .

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2- it does not take off all microbe .
3- it needs to be cleaned regularly, especially when using cloudy water or water containing iron .
4- The flux average is relatively low .
5- Ceramic portions are brittle and hard to transportation .
6- Do not applies for intense turbidity waters .
7- Petite fissures reduce pathogen removal .
8- No residual decontamination effect (risk of recontamination).

*Colloidal silver filters are appropriate for families that use cloudy and polluted water.
Nevertheless , colloidal silver nominee do not elimination fluoride , pesticides , arsenic , or other melted chemicals.
Because of the finite flux average and stock pilling ability , these units are appropriate for small household , organizations or classrooms .
As iron is only partly exclusion , it is suitable to use raw water with few iron (<0.3 mg / L).
The chlorinated water should not be filtered into the colloidal silver filter. Because of the danger of obstruction , water with turbidity greater than 50 NFU must be filtered or settled before settling or filtering to avoid frequent cleaning of the filtrated(18).

The dangers of sterilizing water with silver on DNA structure :-

Scientists from the University of East Anglia in Britain concluded that "sterilizing water with silver leads to serious DNA problems ".
Sterilization of water using silver is a diffuse method in many countries of the world , specially few countries of Africa and Asia, where the salts of this mineral are an effective element to eliminate bacteria(15) .

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Arabs used it in the ancient times :-

This technology is not modern, because silver's superior ability to kill bacteria, microorganisms and algae was used by the Arabs in the past to purify water, as the water was placed in the sacks made of sheep's skin, and nearly three quarters of it was filled with water and the rest was air, and coins were puted in the water .

During long-distance trips, the bag vibrates and the pieces rub against each other, which results in a small part of silver being dissolved in the water in the form of an ultra-fine powder that kills bacteria and disinfects water(15).

Silver instead of chlorine :-

The recent development of the use of silver in purifying water instead of using "chlorine" which is not safe for health, as studies have shown that the dose of silver used in purifying water is less than one in a billion, which is equivalent to one milligram per cubic meter of water, and this means that the cost of cleaning. They are very low, as well as the risks to workers and the surrounding population and those close to chlorine gas, and recent studies have shown that chlorine is carcinogenic and causes miscarriage of pregnant women, as it prevents the fetus from adhering to the womb wall.

From this standpoint, the use of silver was concentrated in sterilizing other types of water, such as water used in power plants, sewage water, industrial cooling towers and swimming pool water (15).

Argyria disease is rare :-

Returning to the study, British scientists said in an article published by the EurekAlert website : " Our latest studies have shown that the silver element may cause the rare disease Argyria, which causes the pigmentation of human skin due to infection with a bluish gray color, and many specialists believe

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that the presence of silver in the water at average 0.1 mg / liter is considered safe, but in fact it leaves its effects on the structure of DNA ".

They explain that they arrive these outcomes after many studies behavior to test the impact of the silver element and its compounds in liquids on a number of laboratory animals, as it was found that these compounds have effects in changing the DNA structure of animals, and also cause clear damage to the work of their sperms(16).

References :-

(1a) Lerica G. Shrestha (Environment and public health organization) , Enpho Bipin Dangol (Environment and public health organization) Enpho Dorothee spuhler (seecon international gmbh),(2009), "CAWST 2009c"

(1b) Lerica G. Shrestha (Environment and public health organization) , Enpho Bipin Dangol (Environment and public health organization) Enpho Dorothee spuhler (seecon international gmbh),(2006), "LANTAGNE ET AL. (2006) , HOUSEHOLD WATER TREATMENT AND SAFE STORAGE OPTIONS IN DEVELOPING COUNTRIES"

(2) Lerica G. Shrestha (Environment and public health organization) , Enpho Bipin Dangol (Environment and public health organization) Enpho Dorothee spuhler (seecon international gmbh),(2009), "CAWST 2009a"

(3) Lerica G. Shrestha (Environment and public health organization) , Enpho Bipin Dangol (Environment and public health organization) Enpho Dorothee spuhler (seecon international gmbh) , (January 2008), Ceramic Filtration , Household Water Treatment Options in Developing Countries Factsheets , "CDC 2008"

(4) Daniele S. Lantagne , Alethia Environmental ,(2001),"Investigation of the Potters Peace Colloidal Silver Impregnated Ceramic Filter" , "LANTAGNE, 2001a".

(5) Lerica G. Shrestha (Environment and public health organization) , Enpho Bipin Dangol (Environment and public health organization) Enpho Dorothee

spuhler (seecon international gmbh ,(2008), Household Water Treatment & Safe Storage(HWTS),Presentation(=Sandec Training Tool 1.0 Model

3,duebendrof: Swiss Federal Institute of Aquatic Science(EAWAG),Department of Water and Sanitation in Developing Countries(SANDEC), "EAWAG/SANDEC 2008"

(6) PH. D. Raghupathy Ramanathan, NASA-Johson space center toxicology group habitability and environment factor branch Houston,texas, "SPACECRAFT WATER EXPOSURE GUIDELINES , FOR SELECTED CONTAMINANTS VOLUME 1",(2004), Ch.1 , page 324 , ISBN 0-309-09166-7 .

(7) Alan B. G. Lansdown ,"SILVER IN HEALTHCARE : ITS ANTIMICROBIAL EFFICACY AND SAFETY IN USE" , (27 may 2010) , Ch.1 , page 4 ,ISBN 987-1-84973-006-8.

(8) Felipe Solsona (Rgional Advisor on water Quality CEPLS-PAHO/WHO) , Juan Pablo Mendez (CONSULTANT),"WATER DISINFECTION", Pan American Center for Sanitary Engineering and Environmental , Sciences pan American Health organization Regional office of the world health organization, (2003),[29].

(9) Caroline Richmond , "RON RIVERA: POTTER WHO DEVELOPED A WATER FILTER THAT SAVED LIVES IN THE THIRD WORLD", The Guardian , (16 october 2008).

(10) Sara Corbett , ,"SOLUTION IN A POT"
The New York Times Magazine , (24 Dec. 2008).

(11) National Research Council(U.A.) , "MOBILIZING SCIENCE-BASED ENTERPRISES FOR ENERGE,WATER,AND MEDICINES IN NIGERIA", Committee on creation of science – based industries in developing countries, Nigerian Academy of Science , National Academies (U.S.) ,(2007) , Page 39 ,ISBN 0-309-11118-8.

(12) Alan B.G. Lansdown ,"SILVER IN HEALTH CARE : ANTIMICROBIAL EFFICACY AND SAFETY IN USE",Hiper u.-c,Elsner p(eds):Biofunctional Textiles and the skin ,Current Dermatol, Basel ,Karger , 2006, v0133,pp17-34, (2006) , ISBN 3-8055-8121-1.

(13) J.A.Spadaro , T.J.Berger , S.D.Barranco , S.E.Chapin , R.O.Becker , "ANTIBACTERIAL EFFECTS OF SILVER ELECTRODES WITH WEAK DIRECT CURRENT", American Society for Microbiology , (1974).

(14) Omid Akhavan & Elham Ghaderi ,"ENHANCEMENT OF ANTIBACTERIAL PROPERTIES OF AG NANORODS BY ELECTRIC FIELD" , Science and technology of advanced Materials,10(1):015003,(19 jan 2009).

(15) Yara Al-maghribi ,"The dangers of sterilizing water with silver on DNA structure" , UNIVERSITY OF EAST ANGLIA , Ghadi News , (Monday- 26 june 2017) .

(16) Yara Al-maghribi ,"The Argyria Disease is Rare", EurekAlert , Ghadi News , (Monday- 26 june 2017) .

(17) Racheli Ben-Knaz Wakshlak , Rami Pedahzur & David Avnir , "ANTIBACTERIAL ACTIVITY OF SILVER-KILLED BACTERIA:THE "ZOMBIES" EFFECT" , Scientific Reports,:5 article 9555,(23 April 2015).

(18) Lerica G. Shrestha (Environment and public health organization) , Enpho Bipin Dangol (Environment and public health organization) Enpho Dorothee spuhler (seecon international gmbh), "The Advantage and Disadvantage of Silver in Water Purification" ,(2008).

(19) Swiss Federal Institute of Aquatic Sciences (IWAG),Water and Sanitation Management in Developing Countries (SANDIQ),(2008),EAWAG/SANDEC(2008).

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المستخلص: -

فلاتر الفضة الغروية هي أجهزة بسيطة تستخدم لمعالجة المياه المنزلية على أساس المعالجة الفيزيائية التي لا تتطلب مصدر طاقة. تستخدم فلاتر الفضة الغروية وعاءً أو شمعة طينية مصنوعًا من مادة خزفية مسامية مثل مرشح السيراميك التقليدي.

ومع ذلك ، في مرشح الفضة الغروية ، تستخدم الفضة الغروية لمنع نمو الكائنات الحية الدقيقة وأنواع أخرى من الميكروبات.

تضمنت المجموعة المرشحة إناءين: الوعاء العلوي يحمل السيراميك المطلي بالفضة الغروية ، ويقوم بتصفية المياه ، ويقتل البكتيريا والكائنات الحية الدقيقة ، والوعاء السفلي يوفر المياه المعالجة.

تزيل مرشحات الفضة الغروية العكارة ومسببات الأمراض من مياه الشرب.

يمكن بناء مرشح الفضة الغروية بمواد معدة محليًا ، والتي يمكن أن تسهم في توسيع التجارة المحلية.