



e-ISSN: 2319-8753 | p-ISSN: 2320-6710

# IJRSET

International Journal of Innovative Research in  
**SCIENCE | ENGINEERING | TECHNOLOGY**

# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Issue 4, April 2021

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

**Impact Factor: 7.512**

9940 572 462

6381 907 438

[ijirset@gmail.com](mailto:ijirset@gmail.com)

[www.ijirset.com](http://www.ijirset.com)

# Water Purification through Ceramic Filters

Prof. Natish Sayyed<sup>(1)</sup>, Prof. Mohit Satpute<sup>(2)</sup>, Shubhangi Patle<sup>(3)</sup>, Komal Dharmik<sup>(4)</sup>, Shriyanka Deheriya<sup>(5)</sup>, Vinay Pande<sup>(6)</sup>, Hitesh Potpose<sup>(7)</sup>

Head of Department of Civil Engineering, NIT Polytechnic College, Nagpur, Maharashtra, India<sup>(1)</sup>

Assistant Professor, Department of Civil Engineering, NIT Polytechnic College, Nagpur, Maharashtra, India<sup>(2)</sup>

Diploma Student, Department of Civil Engineering, NIT Polytechnic College, Nagpur, Maharashtra, India<sup>(3),(4),(5),(6),(7)</sup>

**ABSTRACT:** To continue an earlier effort to manufacture ceramic pot filters is locally available materials, studies were fulfilled towards the improvement of the filter from clay, laterite and sawdust. The clay compound coincides the homogenous mixture of equal volume clay and sawdust. To be determined by flow rate and water quality tests, the filter having 45% of sawdust and 55% of clay body by volume of adapted the best having convinced the satisfactory flow rate and water quality tests (turbidity less than 5 NTU) in addition removal efficiency of suspended solids was 94%.

**KEYWORDS :** Ceramic Pot Filter, homogenous mixture, flow rate and water quality

## I. INTRODUCTION

This is a process of filtration is common form of household water treatment in many portion of the world. Ceramic water filters are low-cost and effective types of water filter that depends on the small pore size of ceramic material to filter dirt, debris and bacteria out of water. In the household water treatment, people use different techniques for purification of water includes boiling, chlorination and bio-sand filtration. All these techniques are used to remove waterborne diseases causing microbes and to reduce turbidity of source water. The techniques used to remove turbidity from water were so expensive and it also reduce water quality. So many people in different places can not afford the expensive technique to purify the water then to solve this problem of filtration the inexpensive device ceramic water filter is used. Various types of ceramic water filters are currently available on the market. Industrial manufactured 'candle' filters include brand called :- Katadyn, Stephanie, Pozzani and Doulton.

The types of ceramic water filters are :- 1. Ceramic Candle Filter. 2. Ceramic Pot Filter.

### 1) Ceramic Candle Filter

Ceramic Candle Filter are simple implement made of clay and used to remove turbidity, suspended materials and pathogens from drinking water. Removal takes place by physical process known as mechanical trapping and adsorption on the ceramic candle which have micro pores.

### 2) Ceramic Pot Filter

A ceramic pot filters is locally available on the market in the shape of flowerpot, made from a porous ceramic material. The water poured into a ceramic pot filter filtrated through the pot material and is collected in an another container (tank). Ceramic silver pot filters are low-cost and eliminate nearly 99.88% water diseases agents for rural point-to-use water treatment. They can be acquired easily and locally manufactured in low-cost. In addendum, the filters are effective purifying water made of pot shape appliance which removes dangerous micro-organisms present in unrefined water through the use of gravity filtration. Ceramic flower pot also known as the filter element used a mixture of clay powder and burn out material are paint with a special solution of silver which kill bacteria.



### Benefits Of Ceramic Pot Filter

- 1.The Ceramic water filters is suitable to process 8 liter of water per batch.
- 2.This produces a daily water supply of 20-30 liter.
- 3.The silver coating ensures disinfection, so further disinfection is not needed.
- 4.Set up in fragile, breaks easily, allowing bad water through undetectable cracks.

## II. METHODOLOGY

Materials : Ceramic Pot are commonly made from clay mixed with a combustible material like Sawdust , Rice husks, laterite.

### 1.Sample collection and preparation

The collected clay soils were packed, labelled and transported to the drying place. The clay soils were associated with equal proportion and dry in the sun rise for 7 days with guidance of the local potters. The clay was grounded with wooden mortar and pestle and screened with 0.5 mm sieve size. The saw dust was collected from local furniture manufacturers. After drying for 7 days it was processed through wooden mortar and pestle like clay. The saw dust was screened with 0.5 mm opening sieve. Grog was grounded with mortar, pestle and sieved using 0.5 mm sieve size.

Ceramic Pot Filter is usually having a diameter of 30cm by 25cm deep, with the capacity of 8 litre. Two variety of ceramic filter, flat-bottom and Round-bottom are presently produced. The ceramic pot generally sits or hangs in the top of the ceramic tank (container)(20-30 litre) which is fitted with the tap on the bottom. A cover is placed on the top of the filter to prevent impurity.

Ceramic Pot Filter are commonly made from local clay mixed with combustible material like sawdust and rice husks or coffee husks. The clay and combustible material are sieved through fine mesh, and then mixed together with water as far as it forms a homogenous mixture. The homogenous mixture is compressed into shape using a mould. When a pot is fired in a pottery oven, the combustible material burns out, leaving a chain of fine pores through which the water can flow through.

Disables the enzyme that pathogenic bacteria and fungi use for oxygen metabolism, thus suffocating them.

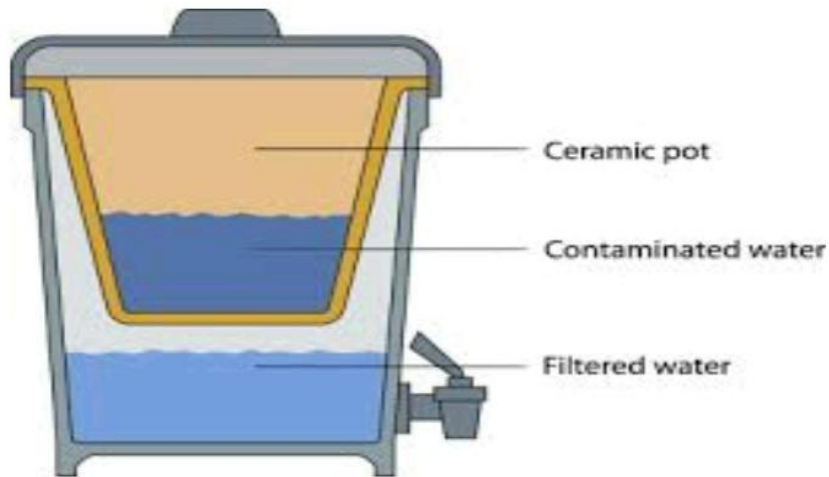
Destroys pathogens with an electric charge, causing their internal protoplast to collapse.

Renders pathogens unable to reproduce.

Kills parasites while in their egg stage.

A combination of biological and physical processes are to remove the pathogens and suspended materials from water.

Quality control on the size of the combustible materials used in the clay mix ensures that the filter pore size is small enough to prevent contaminants from passing through the filter. Colloidal silver aids treatment by splitting down pathogens' cell membranes, causing them to die.



## 2) Operation

Contaminated water is poured into the ceramic pot. The water gradually passes through the pores and is collected in the lower container. The treated water is stored in the container before needed, protecting it from recontamination. The user easily opens the tap at the base of the container when they need water.

For turbidity levels greater than 50 NTU, the water should first be constrained through a cloth or filtered before using the ceramic filter.

The estimated flow rate is 1-3 litres/hour. This is highest when the pot is full. It declines with use and assemblage of contaminants within the filter pores.

## III. MANUFACTURING

Local production of the filters is common and recommended quality control process to assure filter effectiveness is required. The lower container, lid and tap can usually be purchased locally.

Materials and facilities required are:

Clay

Combustible material (e.g. sawdust, rice husks, coffee husks)

Colloidal silver (optional)

Lid

20-30 liter ceramic or plastic container with tap

A ceramic factory requires at least 100 m<sup>2</sup> of covered area

15 to 20 ton hydraulic press (can be fabricated locally)

Filter molds (can be fabricated locally)

Mixer for clay and combustible material (can be fabricated locally)

Hammer mill (can be fabricated locally)

Kiln with an internal area of at least 1 cubic meter (can be fabricated locally)

Racks

Work benches

Miscellaneous tools (e.g. traditional pottery tools)

A professional potter with experience in collecting clay, making ceramic articles, semi-industrial or productivity is required. Assistants, preferably potters are required. Skill and quality control in production is essential to ensure optimum pore size, flow rate and effectiveness.

Working with presses and kilns is potentially dangerous and adequate safety precautions should be used.



#### IV. MAINTENANCE

It is recommended that the filter pot be replaced every 1-2 years. This is in part to protect against fine cracks which possibly have developed and are not visible. Any cracks will reduce the effectiveness since water can be shuffled through the crack without being filtered through the ceramic pores.

There are no moving or mechanical parts to break in the ceramic pot filter. From the naked eye the small cracks are not visible which occur in the pot, but which allow pathogens to pass through the filter. Poor transportation of filters can lead to cracking or breakage. In the lower container the plastic tap will break, metal taps last longer but increase cost.

A supply chain and market availability for backup filters and taps is required. A quality control process is required to ensure filter efficiency. Recontamination is possible during cleaning; care should be taken to use clean water, not to touch the ceramic with dirty hands, and not to place the filter on a dirty surface.

Continued use of the filter causes the pore openings in the ceramic to become clogged with debris. As a result, it decreases the flow rate of water through the filter.

Filters are cleaned by lightly scrubbing the surface when the flow rate is reduced. Some manufacturers recommend to boil the filter every three months to ensure effectiveness. Some manufacturers recommend that soap and chlorine should not be used to clean the filter. The lower container, tap and lid should be cleaned on a regular basis.

## V. RESULT

It is the reduction of bacteria and protozoa in water diarrheal disease incident for users. If the filter remain unbroken then the capacity of filter is very high. It is very inexpensive method and also accessible method for water filtration. The intermediate deposite efficiency of the ceramic filters was found as 59.6%, 86.3%, 87.6%, 56.9%, 59.02%, 88.98%, 76.2%, 52.88%, 46.23% and 226.66 m L/h for turbidity, total coliform, *E. coli*, calcium, magnesium, sulphate, phosphate, iron, nitrite and flow rate, respectively in the analysis.

## VI. CONCLUSION

The Ceramic water filter, were able to enhance the turbidity and microbial quality of drinking water. It is useful and economical method for those who can't afford purifier. It was also urge that additional research be carried out to improve the filtration rate of the ceramic filters. On the bases of result, it is possible to conclude that the ceramic water filtrate that prepared from 80, 25 and 5% clay, sawdust and aqua vitae at firing temperature of 750 °C and 800 °C with lower porosity of the ceramic filter elements calculated to have the best deportation efficiency.



## REFERENCES

1. Morphology, composition and performance of a ceramic filter for household water treatment in Indonesia.
2. Microbiological effectiveness of locally produced ceramic filters for drinking water treatment in Cambodia.
3. Effect of production variables on microbiological removal in locally-produced ceramic filters for household water treatment..
4. Ceramic silver-impregnated pot filters for household drinking water treatment in developing countries: material characterization and performance study.
5. Evaluation del treatment de aqua para consume human mediate filters Life straw ® y Olla Ceramic.
6. Long-term evaluation of the performance of four point-of-use water filters.
7. Removal of virus to protozoan sized particles in point-of-use ceramic water filters.
8. Local Drinking Water Filters Reduce Diarrheal Disease in Cambodia: A Randomized, Controlled Trial of the Ceramic Water Purifier.



9. Investigation of the Potters for Peace Colloidal Silver Impregnated Ceramic Filter Report 1: Intrinsic Effectiveness.
10. Virus removal efficiency of Cambodian ceramic pot water purifiers.
11. Investigation of the Potters for Peace Colloidal Silver Impregnated Ceramic Filter Report 2: Field Investigations.
12. Removal of waterborne bacteria from surface water and groundwater by cost-effective household water treatment systems (HWTS): A sustainable solution for improving water quality in rural communities of Africa.
13. Appropriate Microbial Indicator Tests for Drinking Water in Developing Countries and Assessment of Ceramic Water Filters.



**INNO**  **SPACE**  
SJIF Scientific Journal Impact Factor

**Impact Factor:**  
**7.512**

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
**INDIA**



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 **9940 572 462**  **6381 907 438**  **ijirset@gmail.com**



[www.ijirset.com](http://www.ijirset.com)

Scan to save the contact details