

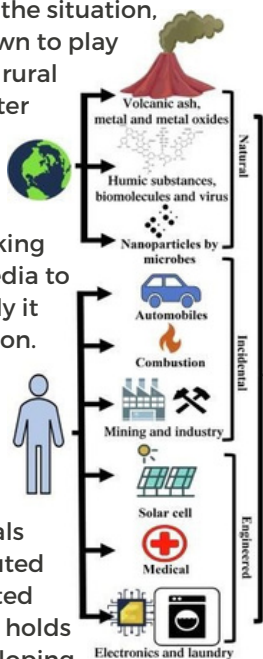
## Water Filtration in Rural Areas

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Water plays a significant role in the survival of humankind. A primary percentage of the rural population depends on water for agriculture, drinking, and survival. Water coming from rain and various sources getting contaminated because of the pollution and the effluents of factories near rural areas. Consuming this contaminated water causes problems and incurable diseases for humankind. Not only is the contamination caused due to pollution, but also some ponds, lakes, and rivers on which the rural depend contain harmful chemicals like fluoride and lead, causing fluorosis, which ultimately leads to bone deformation, various nanoparticles, and so on. From this, many lives have been in danger for a long time. Understanding the situation, filtration is known to play a crucial role in rural areas to get water for all its requirements.

We started working on Filtration media to design and apply it for depth filtration. Using natural materials to make the filter media should not inject harmful materials other than polluted and contaminated water. Cellulose holds a place for developing filter media. Cellulose is obtained from two (02) (majorly) routes from wood pulp and micro-organisms.

Cellulose developed from wood pulp requires the cutting of trees and chemical processing for getting pure cellulose. This cellulose extracted from wood pulp is impure and is very stiff enough, which is not recommendable for filter media.



Cellulose is obtained from a micro-organism which is a bacteria named *Acetobacter xylinum*. The cellulose obtained from this bacterium is in the form of nanofibers, which can be tune able according to its end usage. Because of to have the higher surface area and good particle capturing efficiency, we recommend using nanofibers, which are getting from the above-stated bacteria type and that form bacteria termed Bacterial Cellulose.

To remove the contaminants of solid particles with different particle-capturing mechanisms like interception, impaction, and straining. Other than the particle-capturing mechanism, adsorption plays a key role in capturing the dye and dissolved particles in the water. To implement this mechanism, we are using bacterial cellulose-based filter media for removing particles in the range of nano size.

The permeability and porosity were calculated on a laboratory scale to observe its viability for using it as filter media. The porosity (avg) for a bacterial cellulose pellicle was found to be  $86.01 \pm 4\%$ , & flux was also  $300.1 \pm 10 \text{ Lm}^{-2}\text{h}^{-1}$ , which enhances the possibility of using this pellicle as a filter media.

Filtration efficiency was calculated with experimental using AgNPs (Silver Nano Particle) of range between 30-40nm, got an efficiency of 99%, which shows the excellent particle holding power of a Bacterial Cellulose Pellicle.



(a) Before Experiment



(a) After Experiment  
Bacterial Cellulose Pellicle as Filter Media



Cellulose is obtained from a micro-organism which is a bacteria named *Acetobacter xylinum*

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