

# Design and Fabrication of a Hybrid Plasma Microdischarge and Graphene-Based Water Purification System

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## Abstract

About a decade ago, researchers started investigating the use of nanotechnology towards water processing and purification. The general size of the nanotechnology based water filtration products are smaller than traditional devices which leads to concerns regarding use and maintenance. Recently, graphene and plasma based devices and have also been investigated in a variety of areas of water purification. Research by Nobel Prize winner Andrei Geim with Rahul Nair has indicated that defects of graphene result in a barrier that is highly impermeable to everything except water vapor. Additionally, plasma has been used to chemically treat water to reduce the number of harsh chemicals as well as destroy bacterial and viral organisms. The combination of these two technologies can be useful in water filtration applications. The following work deals with the development of a low cost graphene and plasma based hybrid water purification systems towards removal of organic water and salt based contaminants..

## Stage I Graphene Filter

Based on the experimental setup prototype, two polymer sheet with two fittings, one Cu substrate with a quarter inch hole in the center, two O-rings, and four C-clamp are prepared. Figure (a) shows some prepared parts and Figure (b) is the assembled filter. Figure (c) shows the graphene based water purification setup, the whole system connect two reservoirs, one pump, assembled filter, and variable linear DC power. Figure(d) shows the variable linear DC power. Through change voltage and current, flow rate can be changed.



(a) prepared parts

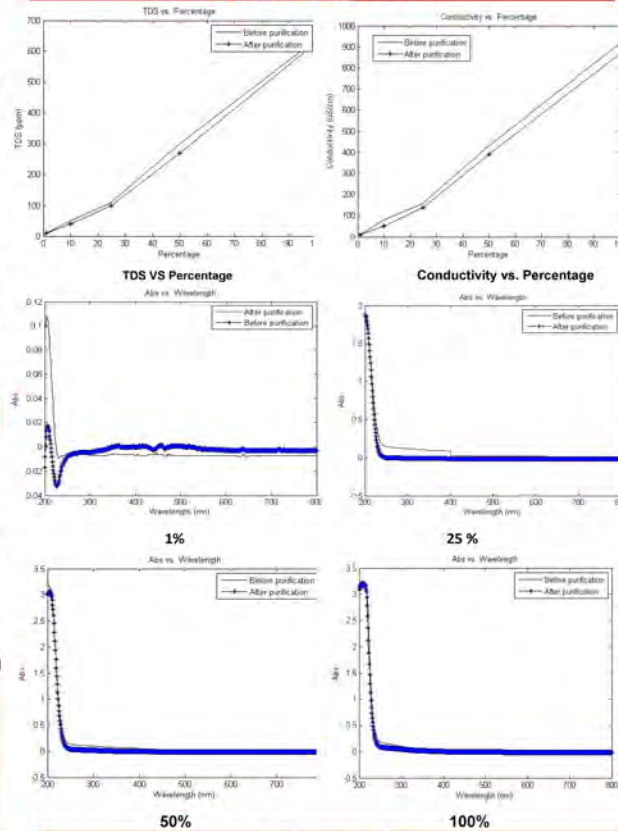
(b) Filter Assembled



(c) Graphene water purification system

(d) Linear DC Power

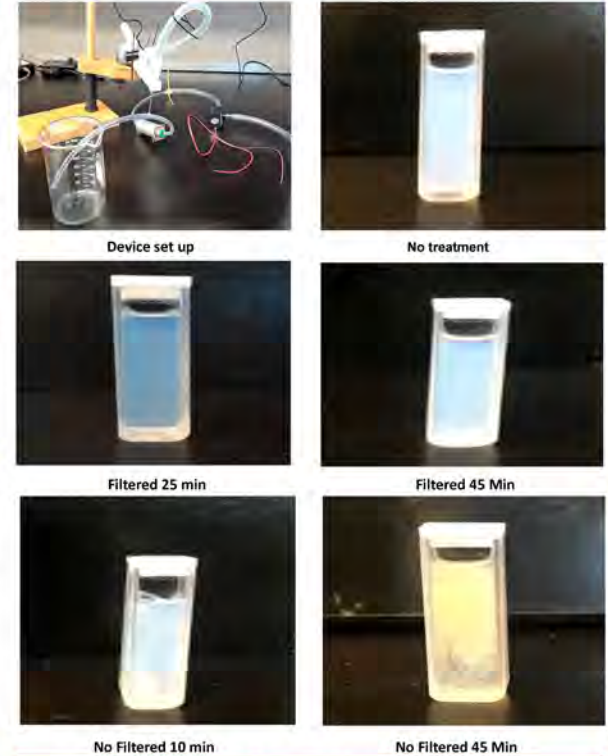
## Stage I Graphene Filter



## Future work



## Stage II Plasma part



## Conclusion

The effectiveness and energy efficiency of the system will be optimized according to collected water contamination data, by using the combine system with graphene filter and plasma filter. The findings shows the water quality is improved and will allow future researchers to begin with an optimized system, providing a foundation for the design of improved water treatment systems that will ameliorate the global deficit of clean water.

## Acknowledgments

