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RESEARCH ARTICLE

PURIFYING WASTEWATER USING EARTHEN MATERIALS AND NANO MEMBRANES

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ABSTRACT

Water purification for human consumption purposes consists in the removal of different contaminants as chemicals (i.e., pollutants, toxic metals), biological contaminants (algae, bacteria, fungi, parasites, and viruses), suspended solids, and gases. But we will use simple method to clean water which has algae, parasites activities, etc. by simple gravel, sand, and earthen materials. Filtration is the process in which the solid particles are removed in a liquid or gaseous fluid are removed by use of filter medium. And control the amount of TDS, EC, pH, and other parameters. We applied simple law of physics that is gravity. We filtered the wastewater from tube containing layer of earthen materials and lastly, we filtered the semi cleaned water from UV membranes (Nano membrane). We used three boxes in which 1st box had small gravels and in other 2nd box had sand and charcoal passed through water from these medium and final products collect in 3rd box and checked the different medias of water. This experiment was performed with different sources of water, and this gave good results with good efficiency of medias like TDS, EC, PH etc. this experiment is performed with low income and with the help of natural coagulants.

KEYWORDS

water cleaning techniques, filtration with nano membranes, wastewater treatment.

1. INTRODUCTION

Wastewater is any water that has been contaminated by human use. Wastewater is "used water from any combination of domestic, industrial, commercial or agricultural activities, surface runoff or storm water, and any sewer inflow or sewer infiltration". Therefore, wastewater is a byproduct of domestic, industrial, commercial, or agricultural activities. The characteristics of wastewater vary depending on the source. Types of wastewaters include domestic wastewater from households, municipal wastewater from communities (also called sewage) and industrial wastewater. Wastewater can contain physical, chemical and biological pollutants (Maya et al., 2016). Water purification for human consumption purposes consists in the removal of different contaminants as chemicals (i.e., pollutants, toxic metals), biological contaminants (algae, bacteria, fungi, parasites, and viruses), suspended solids, and gases.

There are several methods used in the water purification process, which include: physical processes, such as filtration, sedimentation, or distillation; biological processes, such as sand filters, active carbon; chemical processes, such as flocculation, chlorination, the use of ultraviolet light. But we will use simple method to clean water which has algae, parasites activities, etc. by simple gravel, sand and earthen materials (Nkwonta et al., 2010). Gray water is from showers, baths, whirlpool tubs, washing machines, dishwashers and sinks other than the kitchen sink. Black water is from toilets and kitchen sinks. In Pakistan only 1% of the domestic and industrial wastewater receives treatment (Yamina et al., 2013; Huisman and Wood, 1974). According to the Pakistan Water Situational Analysis, there are three wastewater treatment plants in Islamabad, of which only one is functional.

Karachi has two trickling filters, where effluents generally receive screening and sedimentation. Lahore has some screening and grit removal systems, but they are hardly functional. In Faisalabad, there is a wastewater treatment plant, in which wastewater receives primary treatment. In rural areas, wastewater treatment is nonexistent, leading to pollution of surface and groundwate. It is critical to remove pollutants from residential waste water and rain water before releasing it into ground water or reusing it for domestic purposes (Bryant and Tetteh-Narh, 2015; Ngene and Kota-Maharaj, 2020). There are several chemical treatments available to eliminate heavy metals, but these chemicals have significant side effects and are expensive. Natural coagulants are less expensive. Quantity with fewer side effects Natural coagulants such as groundnut shell will be tested for this procedure. Every day, a large amount of rainwater, kitchen waste, and sewage water is lost in order to utilize that water for various purposes. For this aim, I shall employ a natural treatment procedure that is less expensive. To make the filtration efficient.

2. MATERIALS AND METHODS

We applied simple law of physics that is gravity. We passed the wastewater from tube containing layer of earthen materials and lastly, we passed the semi cleaned water from ultra-violet membranes (nano membranes).

First, we took three plastic boxes for wastewater filtration. We created four holes in first two plastic boxes for passage of water and third box did not contain hole because this box was used for collecting filtered water.

First box contained gravels packs. Second box contained with sand, activated carbon and filter paper. These three boxes were putted vertically layer by layer. When wastewater was passed by 1st layer, heavy metals was

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removed by gravel pack.

After removal of heavy metals, water passed from hole of first box and entered in 2nd layer.

In 2nd box sand removed tine particles that are waste products smaller than heavy metals.

Below sand there was activated carbon (charcoal), which reacted with water to maintain TDS, EC and pH by chemical reaction. Surface area was increased with charcoal and water color was also improved.

Below the carbon, we used filter paper for stopping all the above waste material excluded from sand and carbon. At last water taken in box three was filtered water.

After all these steps, we checked water quality measures that were TDS, EC, and pH of water.

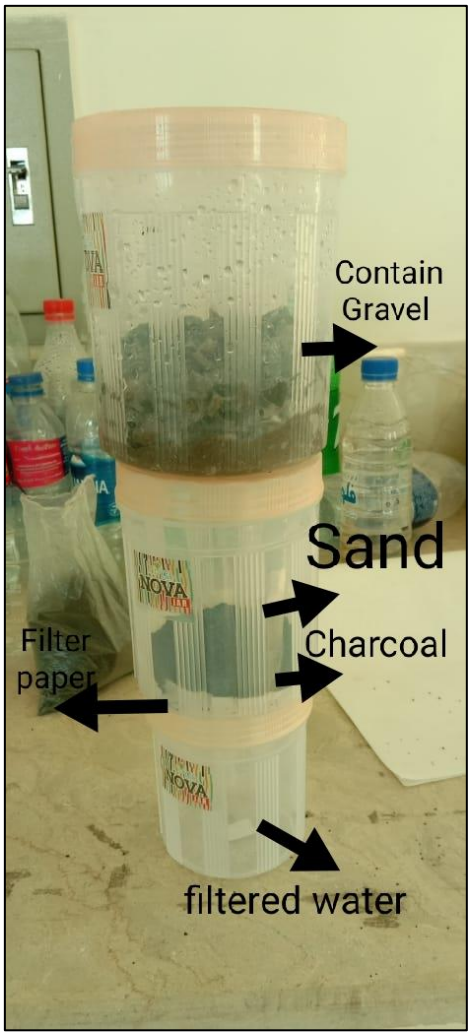

Figure 1: Physical design of the filtration system

3. Results and Discussions

From visually we can say that the process helped us a lot in order to remove the color as well as the pollutants present in the wastewater after passing through the filtration assembly (Pramod et al., 2018). Because the materials were very efficient in order to treat the domestic as well as industrial wastewater this project helped us to treat the water in a less cost way because these materials are easily available in the market and are very cheap we should use them and treat water because they cost us less and give us the better product (Azis et al., 2021).

3.1 Change in TDS with Time

The table 1 showed that TDS (total dissolved salts) decreased with increase in time. At start, the value of TDS was 1211 ppm. As filtration with two boxes proceed and time increased the value of TDS gradually decreased. At first 5 minutes, the value remained 1142 ppm. After 10 minutes later, value becomes 1073 ppm. At last, after 25 minutes the value became 868 ppm. So this showed a positive impact.

Table 1: Reduction of TDS with time

Time (minutes)	TDS (ppm)
0	1211
5	1142
10	1073
15	1005
20	935
25	868

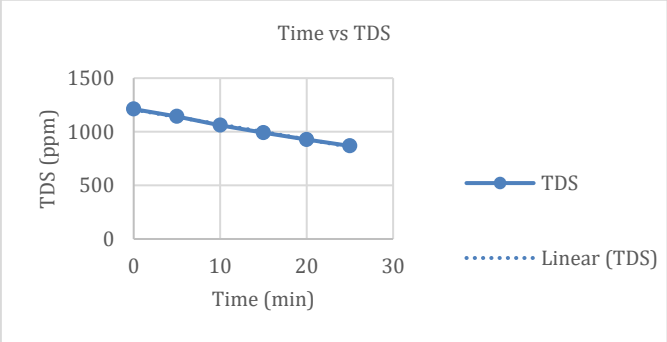

Figure 2: Graph between time and TDS

3.2 Change in EC with Time

The table 3.2 showed that EC (electrical conductivity) decreased with increase in time. At start, the value of EC was 2198. As filtration with two boxes proceed and time increased the value of EC gradually decreased. At first 5 minutes, the value remained 2073. After 10 minutes later, value becomes 1948. At last, after 25 minutes the value became 1574.So this showed a positive impact.

Table 2: Reduction in EC with time

Time (minutes)	EC
0	2198
5	2073
10	1948
15	1823
20	1698
25	1574

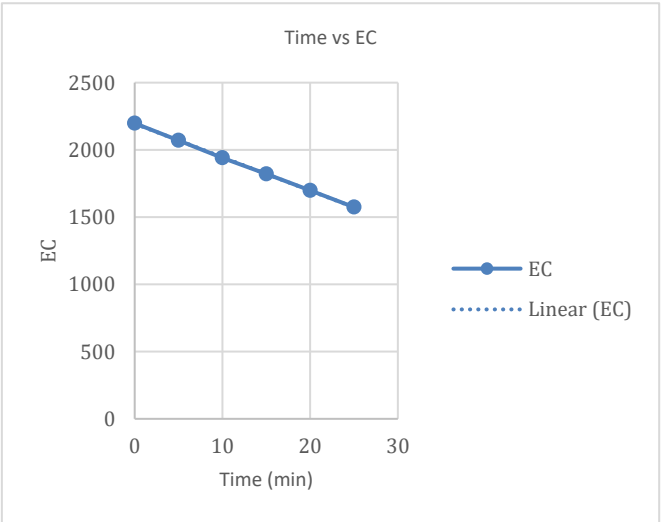

Figure 3: Graph between time and EC

3.3 Change in pH with Time

The table 3 showed that pH decreased with increase in time. At start, the value of pH was 6.93. As filtration with two boxes proceed and time

increased the value of pH gradually decreased. At first 5 minutes, the value remained 6.95. After 10 minutes later, value becomes 6.97. At last, after 25 minutes the value became 7.01.

In which the graph shows that the PH is rise with w.r.t time from 6.93 to 7.03.

Table 3: Reduction of pH with time

Time (minutes)	pH
0	6.93
5	6.95
10	6.97
15	6.99
20	7.01
25	7.03

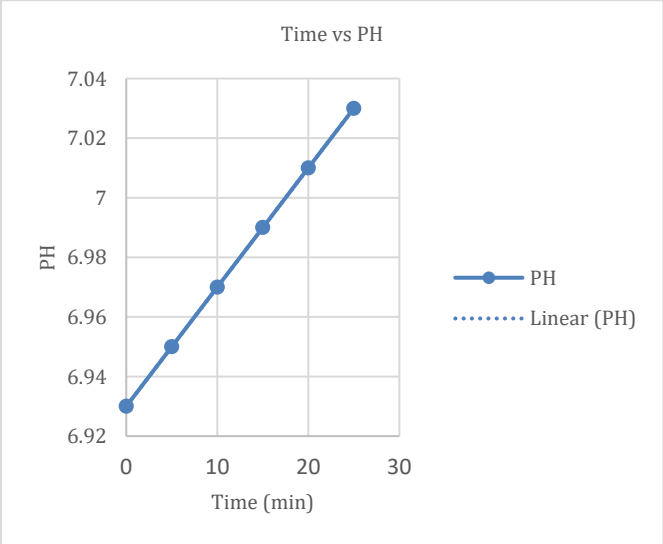

Figure 4: Graph between time and pH

4. Conclusion

The materials are very efficient in order to treat the domestic as well as industrial wastewater this project helps us to treat the water in a less cost way because these materials are easily available in the market and are very cheap, we should use them and treat water because they cost us less and give us the better product. In which the project I take 200ml water for treatment and take almost 23 to 25 mints maximum and give better results of products like TDS, EC, PH etc. The EC low from 2198 to 1574 is a better result on cheap amount and TDS remove from 1211 to 868 and PH rise from 6.93 to 7.03.

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