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Analysis of Water Purification by using Graphene Composite Sand

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Abstract: ***Presence of contaminant beyond certain limit of various pollutants discharged through industrial emission and human activities has lead to water pollution. This problem reduces the quality of life and is felt that there should be an integrated approach for tackling this problem related to water pollution. Therefore to deal with this problem we have to purify water. In this regard, Graphene Composite Sand with their unique physiochemical property is more conductive for a favourable outcome. In this paper the process of preparing Graphene Composite Sand is accessed this technology will be sustainable and cost effective. Test were performed and conducted water. Where Graphene is synthesised from sugar and sand without the need of any binder, which results in a proper and appropriate composite. Efficiency of Graphene Composite Sand was examined by performing different test (pH, alkalinity, hardness, etc.). Although literature reviews have mostly concerned graphene's capability for the adsorption and photocatalysis of water pollutants, updated knowledge related to its sieving properties is quite limited.***
Keywords: Sand, Sugar, Graphene oxide, Water purification, Nano-composite

I. INTRODUCTION

Our Earth's surface is 1/3 covered up by land and 2/3 surface is covered by water. And only 1% is available as fresh water. Earth population continuous to grow with increasing pressure on water resources. The increase in industrialisation and tendency of majority of industries to concentrate in area which are already heavily industrialised, the problem of water pollution has began to be felt in country. Short term studies conducted by the National Environmental Engineering Research Institute, Nagpur has confirmed that the city of Calcutta, Mumbai, etc. are facing impact of water pollution on a steady increasing level. A few statistic illustrate the scale of problem of water pollution around half of the ocean pollution, river pollution and is caused by sewage and waste water pollution. Every year the world generate 5 to 10 billion tonnes of industrial waste out of which most of pumped in to river, ocean and other water bodies untreated. Factories are point source of water pollution but quite a lot of water is polluted by ordinary people from non point source. There are some ways in which ordinary people pollute water are (1) Detergent in washing machine. (2) Waste water from kitchen. (3) Waste water from wc and bath. (4) Toxic pollution also enter from highway runoff. Fascinating new addition of technology for water purification. One of the technology is nano-technology. The application of air, water and soil are intensionally pursued in recent years. In carbon family the new addition is of carbon allotrope is Graphene, the one atom thick sheet of carbon. One of the water purification technique is Graphene Composite Sand. It can be an effective absorbent and that remove heavy metal ions, alkalinity, pH, turbidity, etc. Graphene Composite Sand shows high absorption capacity in comparison to conventional method. Application requires materials to be affordable to make Graphene Composite Sand. Among these the simplest and cheapest natural source of carbon is sugar which will be allowing only water to pass through it.

II. MATERIALS AND METHODOLOGY

A. Materials

1) Sand - Sand is a granular material composed of finely divided rock and mineral particles. It is defined by size, being finer than gravel and coarser than silt.
2) Sugar - Sugar is generic name for sweet tasting, double carbohydrates, many of which used in food.
3) Sulphuric acid - Sulphuric acid is also know as vitriol, is a mineral acid composed of the elements sulphur, oxygen and hydrogen. It is a colourless, odourless and syrupy liquid that is soluble in water, it is highly exothermic

B. Methodology

Sugar was used as the carbon source. At first, the sugar was dissolved in water and then, the solution was mixed with requisite amount of sand. Calculated amount of sugar and sand were taken to make different loading ratios. In each case, the mixture was dried at ~95 degree celsius in a electric induction for about 6 hours with constant stirring. The sugar coated sand was then placed in

a silica crucible and heated in a Muffle furnace . The furnace temperature was programmed to ensure complete graphitisation. The temperature of 750 degree celsius was chosen as the final temperature after optimisation through several experiments. The black sample was named Graphene Composite Sand (GCS). For activation, 5 gram of the composite was treated with 10ml of concentrated sulphuric acid and kept undisturbed at room temperature for 30 min washing with concentrated sulphuric acid leads the composite with higher adsorption sites. The mixture was then filtered and dried at 120 degree celsius and stored in air tight containers.

C. Experimental Study

TABLE I
WATER CHARACTERISTICS

Sr. no	Parameter	Before Filtration	After Filtration	Standard Permissible Value
1.	pH	7.62	6.97	6.5 - 8.5
2.	Alkalinity	720 mg/l	580 mg/l	600 mg/l
3.	Aparrant Color	Greyish Green	Colourless	-
4.	Turbidity(NTU)	11	5	5
5.	Chlorides	1090 mg/l	890 mg/l	1000 mg/l
6	TDS	1160 mg/l	740mg/l	500 mg/l
7	Total Hardness	1200 mg/l	840 mg/l	600 mg/l
8	COD	280mg/l	160 mg/l	250 mg/l

D. Results

Fig. 1 and fig. 2 shows us, that our sample contaminants after filtration has comes down to certain level. In case of pH, apparent colour, COD, alkalinity and turbidity the sample has passed after passing through Graphene Composite Sand. But, in total dissolved solids and total hardness the level of contaminants is above the permissible level.

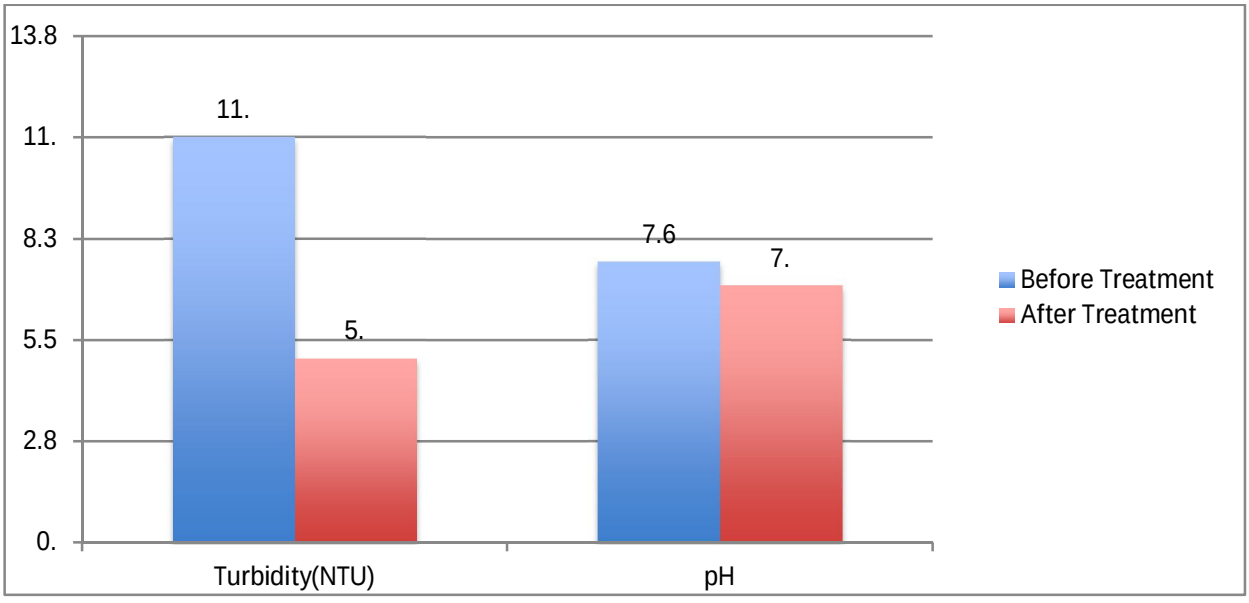

Figure 1 -Water contaminates before and after treatment

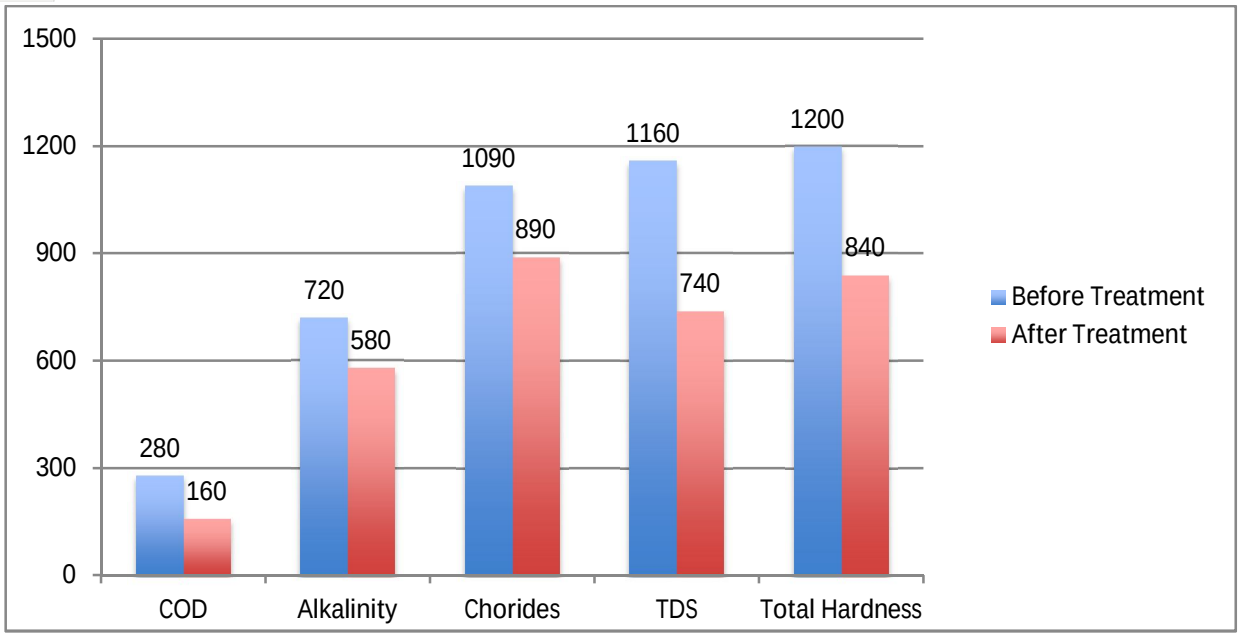

Figure 2 -Water contaminates before and after treatment

III.CONCLUSIONS

The Graphene Composite Sand has a simple preparation process of a good separation performance. Ratio of sand:sugar (70:30) was used to get more effective results. Experiment on different ratio of sand:sugar should be performed. To increase the efficiency and clean water, the contact time between Graphene Composite Sand and sample water should be increased. It can be increased by increasing the thickness of bed of Graphene Composite Sand. The sample collected from the river must be tested the day to avoid stagnation of water. In the view of ion transport principle, Graphene membrane is not yet clear and needs a deep knowledge. When it is applied for above parameters such as total dissolved solids, total hardness and pH, etc. For sustainable development, materials like Graphene Composite Sand should be looked out to contributes towards and affordable potable water. Last but not list, the large scale controlled production of Graphene Composite Sand for different industries is still a challenge and needs further studies to clearly understand it.

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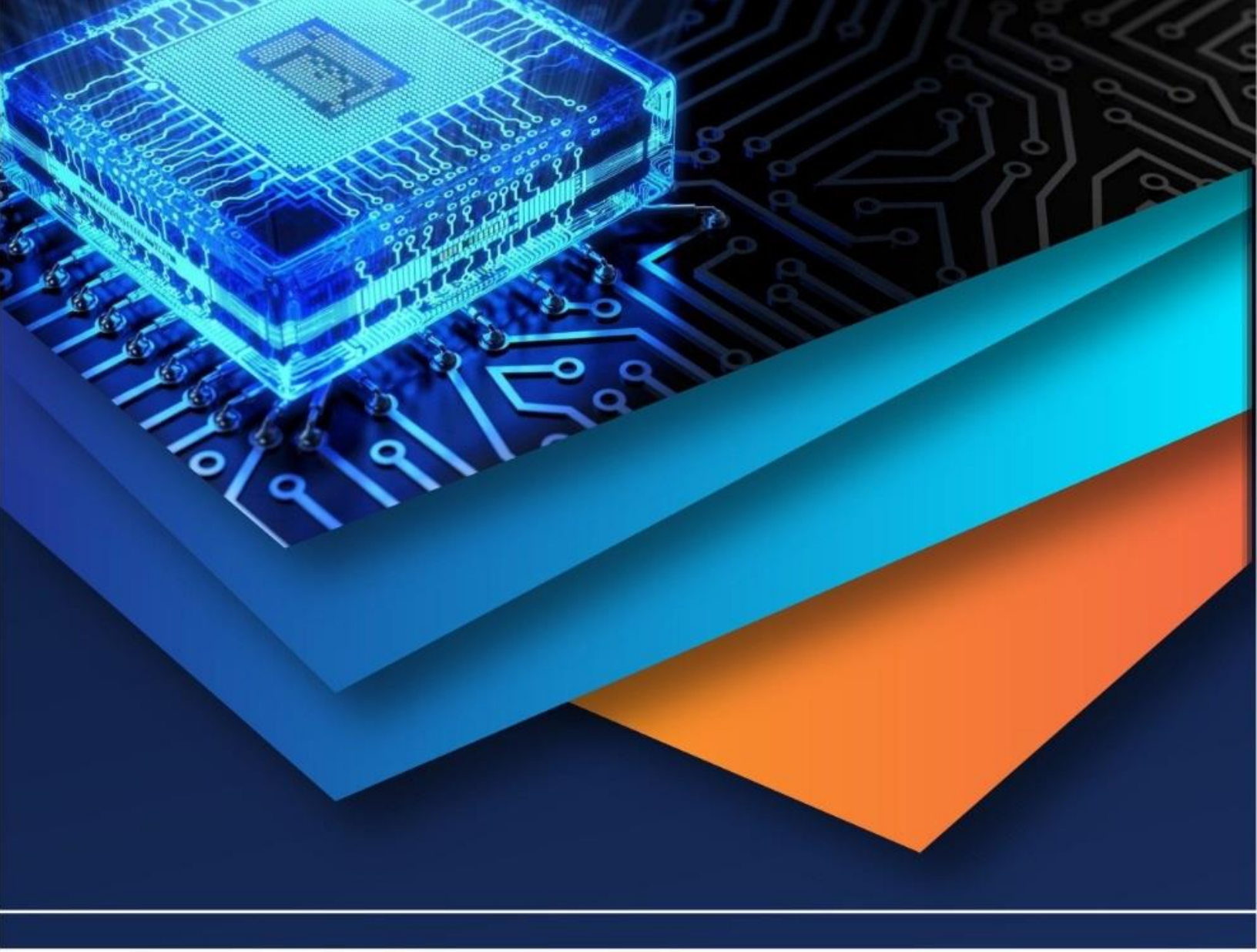

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