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Incorporation of Activated Carbon and Graphene composition for waste water treatment

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Abstract: A modern day running with technology, but concern towards sustainable environment is very poor. This perspective paper is with enriched content of water treatment suitable to the study area of the campus of KG Reddy College of Engineering and Technology, Hyderabad. This study aims to spread the light on the concept of sustainable water treatment materials for waste water generated in the campus like canteen waste water and washroom waste water. Activated carbon, Graphene materials and its composition are blowing sound wave interest in the field of water treatment because of its good adsorption capacity and low cost availability. This study mainly focuses on composite treatment materials by considering activated carbon and graphene as the best composition. As per literature survey, we found both materials having good adsorption capacity, by studying both material physical and chemical characteristics the study perspective introduced the new methodology with graphene and activated carbon composition by keeping literatures as evidence. The study also helps to design the low cost water filtration and this paper highlights the prime considered waste water characteristics which plays a major role in the water treatment process.

Keywords: Activated carbon, adsorption, Graphene, and pollutants.

1. INTRODUCTION:

With an increasing population, the widening of urbanization and industrialization are increasing in the high speed running technology, because of these man-made activities, nature is losing the natural resource's quality as well as quantity. Among the elements of nature, water is one of the important elements on the planet, so it needs to be preserved for future generations.

Activated carbon is largely used in water purification on account of large specific surface area, good absorbent capacity and microspores. The total surface area of activated carbon pore wall is generally varies between 500-1700 m2/g and small microspores compared with other materials adsorption, which is also the main reason for the strong adsorption ability and adsorption capacity of activated carbon (Jiang Changjia, et. at. 2019). The graphene is found as one of the sub-element of graphite (Yongchen Liu 2017). Graphene oxide is found fine in the hydrophilic character, and it has been attempted to be used as thin films for water treatment in these modern days. The chemical oxidation method has been used to acquire the graphene oxidation surface because of the presence of oxygen in its property of having more polar oxygen epoxy groups, carboxyl and functional groups; it also facilitates the different hydroxyl groups' distribution. In the way of dispersion of graphene in water possess enough hydroxyl groups, which gives two ions are negative acid and hydrogen to shape out firm dispersion of oxidized graphene.

This study highlights suitable methods for treating wastewater generated in the campus KGRCET. This highlights the sustainable materials used for treatment like activated carbon and graphene. As per our study graphene and activated carbon were found very well in adsorption character. The process of activated carbon adsorption is one of the significant subjects that need to be considered in the field of water treatment, and its cost effective application is dependent on an understanding of the adsorbent and the processes influencing its use. This prospective study describes the application of activated carbon and graphene in drinking water treatment by considering adsorption strategy.

2. Application and role of Activated carbon in waste water treatment:

Activated carbon is formed and it can be differentiated by three sessions: reticular carbon of single plane, micro crystals of graphite and carbon in amorphous form but microcrystal of graphite has been found more prime considered part in it and it found something different than all types of carbon in graphite types. The property of adsorption in activated carbon is linked to pore structure and specific surface area, this area roughly varies between 500-700 m2/g (Jiang

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Changjia, et. at. 2019). Normally activation process works at higher level temperature which generates rich porous structure in the carbon content material (Martin J. Sweetman et. at. 2017). Adsorption of organic contaminants by adsorptive capacity of carbon is globally identified and has been applied in water treatment. For aromatic compounds, the adsorption capacity of activated carbon depends on adsorbent physical character, functional group, volume of pores,ash level, adsorbate structure and its functional group, molecular weight, pH, strength of ion formation and quantity of adsorbate, activated carbon is found better use in nano-composites to get enough adsorption results (Mahsa Bagheri et. at. 2019).

3. APPLICATION AND ROLE OF GRAPHENE IN WASTE WATER TREATMENT:

Graphene is one of the supreme considered molecules in adsorption capacity composed of multi layered carbon atoms oriented hexagonal lattice (Mahsa Bagheri et. at. 2019). Graphene has major recommended characteristics like large surface area, high electrical conductivity, fracture resistance and good rate of heat transfer. It has advantages like good cost efficiency, and it found the best value of a high surface to volume ratio if we compared with other carbon and nanotubes. Graphene is widely used for water purification by converting into graphene oxide by using the method of process of an acid treatment. More count of hydrophilic oxygen having groups in the graphene sheet with peroxides and hydroxyls are results by converted graphene oxide (Megawati Zunita 2021). The author Mahas bhageri explained preparation of Graphene oxide as, Graphene oxide is prepared by starting with, mixing of graphite of 5-7 micron and 1.5g nitrate with presence of iced bath, then it follows the 98%of sulphuric acid. Next for two hours potassium permanganate has to be added. This mixture needs to be stored for 5 days at ambient temperature. To neutralize potassium permanganate the hydrogen peroxide has been added. 250ml of this solution is mixed with 98% of sulphuric acid along with hydrogen peroxide and follows the addition of water which will be double distilled until getting yellowish. Some of important characteristics like electrostatic, pollutant/contaminant interaction, hydrogen bonding in material of graphene are considered as good adsorption capacity materials in graphene.

4. CONCLUSION:

As a brief literature survey, the prospective study found that activated carbon is mainly used in water treatment because of its structures pore and more surface area. Graphene is also having more good features as activated carbon. Graphene layered filters can be used to filter the water for drinking purpose because of its pi to pi bond interaction among contaminants and its higher surface area, but if we compare graphene with activated carbon, the graphene is found to be more expensive. As per requirement the composition idea has brought new look to water treatment. As per study of secondary sources it shows composition of activated carbon and graphene, the graphene does not need to be form graphene oxide, but wastewater needs to pass through the activated carbon then it follows to graphene, where water need to get stored for while in order to adsorb the enough organic contaminants. The amorphous state of carbon with some other forms like iron oxide usage found good in order to remove the arsenic pollutant and silver nanoparticles combination helps antibacterial fabrication. Waste water treatment using activated carbon with 24hr of variation facility following the graphene sheets flow is expected to increase efficiency of treatment. It is one of the interesting studies to work on this practically to check the treatment efficiency.

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