# A Multipurpose Vacuum Cleaner - Using A Nanomaterial Graphene

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***Abstract*— In this paper, we intend to do a vacuum cleaner with a nanomaterial graphene. We look forward to an alternative choice to the batteries used in existing vacuum cleaners. Lithium-ion batteries are self-discharging and have the disadvantage of a short lifetime. Graphene can make long-lasting, light and high storage capacity batteries. These graphene material has been coated to the anode of the lithium-ion batteries to intensify their properties. Graphene can overcome dissipation of heat which can enhance the efficiency of the device. This paper also aims to renew the energy using vacuum cleaners which acts a multipurpose household electronics. Vacuum cleaners made up of graphene functions as a solar cell, purifier, desalinator.**

***Keywords—Vacuum Cleaners, Graphene, Desalination, Energy Conservation.***

## I. INTRODUCTION

Even though robotic vacuum cleaners have more advantages, the battery life is still a major demand. Realization of how long a unit has run on battery and this a reason our devices stop working. Moreover, robotic vacuum cleaners use rechargeable lithium-ion batteries. Lithium-ions batteries are high-end batteries in terms of mass vs. capacity, has no memory effect, discharged with high current, exorbitant[1].Robotic vacuum cleaners are designed to be slim, compact and sleek as possible. Due to this pressure from the cleaner surrounding the battery may cause damage to the electrodes, short-circuiting or results in flammable electrolyte inside to heat up.

## II. ROBOTIC VACUUM CLEANERS

Dyson a robotic vacuum cleaner uses a battery whose charge time is approximate and it also depends on the operating temperature. Runtime is approximate, influenced by the time robot has been charging and cleaning the environment. Battery life is about 30-40 minutes per charge on full suction[2].

## III. GRAPHENE

To conquer these drawbacks, a future based allotrope of carbon named graphene can be used in robotic vacuum cleaners as batteries. Though graphene the strongest material ever discovered possesses charge density million times that of copper.

### *A. Graphene Features*

Because of a very thin atomic thickness of 0.345 nm the size of robotic vacuum cleaners can be reduced further. Graphene batteries do not rely on temperature. In combination with other fuel cells, graphene absorbs the heat energy produced in the solution into electricity. The existence of the human in the environment of robotic vacuum cleaners which contains graphene battery leads to the absorbance of body heat.It also removes unwanted heat from the electronics. These are stored as renewable energy and used for running other electronics devices or itself.

### *B. Graphene Magnetic Property*

Graphene has a magnetic property of honeycomb-like arrays of hydrogen-terminated nanopores. Coating of the layer inside the robotic vacuum cleaners may enable to remove the deposits of few iron particles which reduce the additional design and cost.

Figure 1. Graphene structure

### *C. Absorbing Power*

Graphene absorbs solar energy which can be harnessed. It stores hydrogen which can be used as power for the movement of vacuum cleaners. It can absorb moisture and withstand humidity.

*D. Graphene On Thermal Industries*

Graphene can at higher temperatures of about up to 60 degrees. This can be able to overcome failure in operation in cases of any short-circuiting. Thermal industries may also use these graphene-based vacuum cleaners for cleaning high-temperature surface.

*E. Graphene Effect On Pressure*

Graphene remains stable at the very high pressure up to 100 bars. In case any wastes get pinned into the vacuum cleaners, the pressure increases which results in the device to function normally. But graphene has the ability to push high-pressure membranes which is the best property to overcome device failure.

Membranes having high operating pressures have higher water recovery properties at high energy efficiency that supports desalination. Hence graphene due to its micro-membranes and pores can greatly support desalination and recycling.

*F. Graphene Vacuum Cleaner*

- A layer of graphene is to be paired with the thin underlying substrate that contains tiny holes or pores. A Nowadays graphene sheet is done by chemical vaporization.
- The pores of this sheet should of the diameter of 30 nanometers to 3 microns in diameters.
- The sheet can attach at the bottom layer of robotic vacuum cleaners. A dust bag can be connected externally to the graphene layer with a help of tube made up of graphene. In case of the interrupt due to solid particles, high pressure generated in the graphene layer pushes the solid waste externally.
- It then passes into a tube and gets settled down in the dust bag. As a result, this method helps us to clean solids like stones.
- Graphene tubes because of its rigid structure may not get damaged with any type of solid particles. Graphene is flexible, thin, light weighted and even a nanoparticle, it can be made compact as possible.

*G. Graphene Vacuum Cleaner As A Purifier*

- A graphene membrane layer, when lined with a mixture of titanium oxide and cerium oxide nanoparticles, acts an excellent absorbent.
- The layer is fixed at the bottom of the vacuum cleaners. When it works on the surface containing liquid wastes, it absorbs the liquid and separates the pollutants from water.
- The water is then collected with a separate pipe arrangement which can be detached to reduce complexity.
- This layer can also remove oil from water which can meet the requirements of oil spills in industries.

*H. Graphene Vacuum Cleaner As A Desalinator*

- As a high pressure is required in the process of desalination the pressure produced in the vacuum cleaner is applied on the one side of the graphene membrane layer.
- During the suction liquid waste from the floor, this pressure removes the salts and waste from the liquid, as a result, fresh water is an output.
- Demands in the need of freshwater will be met through desalination in future.
- As graphene membrane can operate at the higher pressure up to 100 bar an effective desalination process can be achieved.
- The fresh water can be pumped out by means of pipe arrangement which is detachable.
- Even the reverse osmosis can be achieved with this technique.

*I. Non-Flammable Graphene Vacuum Cleaner*

- Replacing lithium-ion batteries with graphene batteries in vacuum cleaner terminates the risk of short circuit.
- Graphene can withstand 150 degrees Celsius in an atmosphere and 620 degrees at vacuum.
- In case of any liberation of large amount of heat may not damage the device
- The nanosize of the graphene batteries reduce the size of the vacuum cleaners
- Graphene batteries are able to fix any size of battery holder because of its flexible nature.

*J. Graphene Vacuum Cleaner As Solar Cell*

- As when these vacuum cleaners are used for cleaning in the external environment or during the daytime it can absorb the solar energy.
- This energy can be harvested and given as a power supply to the same vacuum cleaner or other small electronic devices in the home.

- It also absorbs microwaves if there is any leakage in the oven and harvests it into energy.

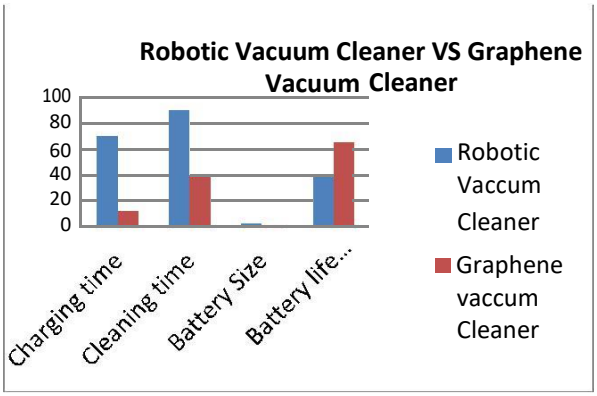


Figure 2. A graph that shows a efficiency of using graphene in vacuum cleaners over robotic vacuum cleaners.

## IV. CONCLUSION

These graphene vacuum cleaners will satisfy the great demand in an economy of household and industries. The multi-functions like purifications, solar energy harvesting, desalination, absorption will deserve a major place in domestic industries. Future technology may focus on graphene to convert these electronic devices into more flexible which can be compact, foldable and portable. Thus vacuum cleaners can be more favorable when manufactured with graphene and operated with graphene batteries.

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