Question 1: Summarize the main findings of the paper in a minimum of 400 words. The summary should be written in a way that the reader can understand the issue being addressed in the paper and the solution presented. There is no limit on the maximum number of words.

ANSWER

In this paper, the researchers are looking at ways to combat the impact of the coronavirus pandemic. One big concern they have identified is the wellbeing of health care workers. As they are present at the front lines they are constantly exposed to the virus when treating patients. The infection of health care workers with COVID-19 is causing significant detrimental effects to health systems in different countries worldwide. One way doctors and nurses protect themselves is by wearing personal protection equipment or PPE for short. Yet these PPE kits cannot be reused and do not insure that the wearer will be a hundred percent protected. The researchers recommend a way to sanitize these PPE's by using electric currents that they claim can kill the virus. They describe a method using a high voltage generator. Although the researchers use the properties and characteristics of SARS-COV-1, they claim it is similar enough to SARS-COV-2 that it will work on it as well. The method uses a metallic material coated with carbon nanotubes (or CNT for short). There are many different ways to get a high DC voltage from small DC source such as by using transformers. This system to clean the PPE will be implemented by building a cleaning station where the clothing can be put and it can be sanitized in a very short time.

The source used is 5V and the output voltage is 30kV. The researchers have designed a generator to make this work. They have attached the negative charge to ground, and let the positive charge accumulate over the metallic surface. This charge accumulation will create a very strong electric field that will be used to kill the COVID-19 virus. As the researchers have studied that the virus has its own induced dipole created by the protein compounds inside the virus. If this dipole is altered the virus will be irreversibly changed. Hence, principles from electrostatics have used in the working of this system. It is known that there exists a net negative charge in COVID-19 virus, and the strong electric field created by the high voltage will greatly damage the virus by disrupting its dipole and hence its structure. As this will have disrupted the dipole will let salt ions to diffuse into the virus and destroy it.

The PPE proposed will include having a layer on the gloves coated with carbon nanotubes. The positive output will be attached to this layer. And the negative output will be attached to ground. Different materials such as copper and aluminum have been proposed for the metallic layer. Basically any metal that can readily conduct electric is useable. And so from research they have concluded that the virus may be destroyed in as little as three seconds.

Word count: 457

Question 2: The paper discusses different equations that are related to electrostatics. Identify the equations that we have studied in this course

Equations used:

Couloumbs law

Gauss's Law

Maxwells second equation for static electric fields

Equation for potential difference of electric field

Equation for potential energy required to move from one point to another (or work done when moving from one point to another)