Investigation Of the Conductive Polymer Nano Composites as Photoelectric Materials

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ABSTRACT

In this paper, a special-purpose conductive polymer nanocomposite is fabricated. It is based on the mixture of the calcium metal powder and the various thermoplastic polymers such as nylon-66 for their experimental photoelectric characteristics. The wavelength of the light source studied in this experiment is in the Ultra-Violet-A (UV-A) region. The wave is generated using commercial UV-LED lamps. The experiment target is fabricating an electrical light-dependent resistor (LDR). The fabricated LDR made up of the proposed nanocomposite is sensitive to the ultraviolet light. The results of the experiments show that the electrical conductivity of the proposed nanocomposite LDR increases while exposed to the UV-A light. The proposed concept may be utilized as light-sensitive electrical devices in the commercial and medical applications.

MATERIAL AND METHOD

industrial-grade Calcium metal in the form of ingots is provided to make the proposed nanocomposite. It is pulverized using a high-strength cryogenic mills. Next, the weight of the produced powder is measured and then it is mixed with a nylon thermoplastic melt with the ratio of 7:3 for 5 minutes. Then the mixture is moulded into the various shapes. Finally, 2 copper wire terminals are connected into the melted composite and the Nano-composite gets cold to be solidified.

Result

The experimental method involves measuring the electrical resistance of the nanocomposite at complete darkness with the digital ohmmeter, at the ambient light of the laboratory and then it is exposed to 395 nm and 365 nm ultraviolet power LEDs [10]. The recorded resistances are shown in Table 1. Significant reduction in electrical resistance of the nanocomposite under the ultraviolet radiation indicates good and linear photoelectric behaviour of the Calcium nanoparticle networks. By ultraviolet radiation on the composite, the polymer matrix acts as a light lens and focuses the photons on the surface of the nanoparticles. Calcium nanoparticles direct their generated photoelectrons through the lattice to the outer surface of the composite.

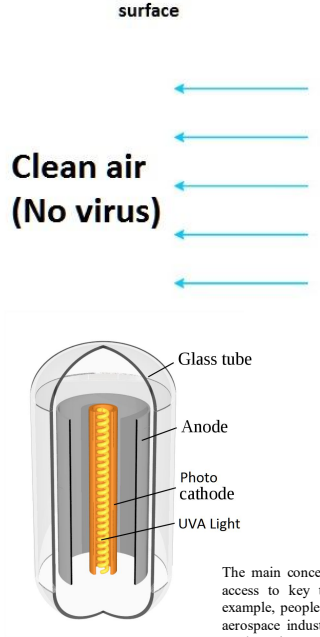
Test	Exposed light	Resistance (Ohm)
1	Darkness	3.722 K
2	Ambient Light	3.721 K
3	395 nm	2.466 K
4	365 nm	1.898 K

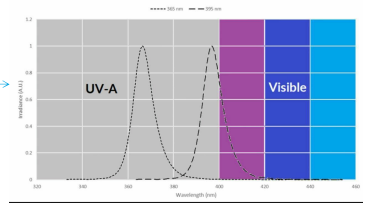
CONCLUSIONS

In this paper, the feasibility of a special-purpose conductive polymer nanocomposite was investigated. It was made up of a mixture of calcium metal powder and various thermoplastic polymers such as nylon-66. The wavelength of the light source studied in this experiment is in the Ultra-Violet-A (UV-A) region. The fabricated LDR made up of the proposed nanocomposite is sensitive to ultraviolet light. The results of the experiments showed that the electrical conductivity of the proposed nanocomposite LDR increases while exposed to UV-A light. According to the achieved results, the fabricated nanocomposite may be attractive for making some applications such as small, cool, lightweight and low-cost pulsed microwave or X-ray cathode ray tubes. Also, if it is printed in the form of open-cell foam with the help of a 3D printer, it can be tidied to make electrostatic filters cathode.

Applications

- ElectroStatic Filter catode
- Vaccum tubes(Magnetron , Klystron , diode , thriode , etc.)
- Ultra- violet Depended Resistor





The main concern of the health sector, aviation and electronics industries is access to key technologies, especially in the nanotechnology sector. For example, people are calling for the prevention of coronavirus infection. In the aerospace industry, the need for low-cost and advanced telecommunications products is a major concern. In the electronics industry, access to printable technologies by printers is also required.

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