

## **Fabrication of TENG inspired Ag-Cu coated banana fabric textile for wearable and sustainable Bio Sensor adopting plasma sputtering technology**

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A banana fabric of dimension 5x5 cm is chosen as the base material for the Biosensor. First of all, Ag is deposited on the fabric using the DC magnetron sputtering technique under the experimental conditions of  $1 \times 10^{-3}$  mbar base pressure,  $4 \times 10^{-2}$  mbar working pressure and 23W power for a time duration of 5, 10, 15, 20, 25 & 30 minutes. Characterizations of the surface modification of the Ag-coated fabric are analyzed by XRD, SEM, FTIR and optimized at 20, 25, and 30-minute sputtering conditions. A second level of Cu coating is done on top of it following the similar DC magnetron sputtering technique under the experimental conditions of  $8 \times 10^{-3}$  mbar base pressure,  $8 \times 10^{-2}$  mbar working pressure and 60W power for a time duration of 20 minutes (optimized result). The two-layer coating is done to observe the tribological behavior under the application of an external force following TENG<sup>[1,2]</sup> (Tribo Electric Nano Generator) principle so that it can be used as a stress/strain sensor or pressure sensor in the wearable healthcare system.

It is observed that Ag/Cu nanoparticle-embedded banana fabric is conducting in nature as revealed by I-V characteristics carried out with Keithley Ammeter. The sensors also respond in piezoresistive manner. The pressure-sensing behavior is confirmed by the load versus resistance or current test using UTM (Universal Testing Machine). It is found that all three optimized sensors S1, S2, and S3 are sensitive to a lower pressure range of 1KPa and a higher-pressure range of 350Kpa. However, the best sensitivity is found to be for the sensor S3 at a lower pressure of 1Kpa.

These Biosensors may be applicable for measuring feeble physical movements in humans or patients such as wrist pulse waves, vocal vibrations and walking patterns etc. in the form of electrical signals. Such investigations are considered to be innovative and sustainable in medical diagnostics systems.

This work is supported by DST, Govt. of India to carry out the investigation under the project, reference number DST/WOS-A/PM-8/2021(C).

### References

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