Carbonaceous nanomaterial polymer composites-based soft sensors for human motion monitoring

Dr. Debarun Sengupta[1,2]
[1] *Flexible Bioelectronics and Wearables Lab, Shiv Nadar Institution of Eminence, NH-91, Tehsil Dadri, Greater Noida, India*
[2] *Bioinspired MEMS and Biomedical Devices group, University of Groningen, Groningen 9747 AG, The Netherlands*
debarun.sengupta@snu.edu.in

Abstract

Remote health monitoring and telemedicine will dominate the healthcare industry in the foreseeable future. The need of the hour is robust, reliable, sensitive, and inexpensive wearable sensors capable of providing intimate and detailed information regarding a person's physiological parameters. However, it is also critical that such sensors are environmentally friendly and that production is sustainable. In this talk, I will present our group's work involving low-dimensional carbonaceous nanomaterial polymer composites-based soft, flexible, and stretchable sensors for applications in wearables for human physiological parameters monitoring. In our past work, the effect of graphene nanofiller addition on the dielectric response and pressure sensitivity has been reported [1,2]. The sensor featured in the work entailed a 0.25 wt.% graphene-loaded electrospun nanofiber membrane sandwiched between two layers of fabric-based flexible electrodes. Recently, we have also demonstrated the application of the optimized graphene-loaded PVAc-Nanofiber-based sensors for insole-based comprehensive gait monitoring [3]. Building on the material- and device-level insights, our recent effort has focused on tunable and architected sensing platforms, including carbonaceous nanomaterials functionalized 3D printed lattice-based soft piezocapacitive sensors and lased induced graphene (LIG)-PDMS composite-based stretchable piezoresistive sensors. The sensing mechanisms and fabrication strategies afford advantages such as mechanical tunability, high sensitivity, and robust sensing performance. Furthermore, these sensing mechanisms together enable multimodal sensing and tracking of multiple human physiological parameters, including gait, tactile pressure, and respiratory patterns. The degradability of our sensors has been demonstrated previously [1], and it is expected that sensors similar to the one presented here will gain widespread acceptance for future applications in flexible electronics and wearable devices.

References

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