# Flexible graphene-based electrodes for biosensing in wearable devices

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Non-invasive, wearable devices for continuous detection of biomarkers in biological fluids are nowadays possible thanks to the presence on the market of disposable electrodes, which employ low amounts of solution and allow a simple, fast, and reproducible analyte detection. To impart best performance to the sensor response, various nanomaterials can be included in the printed ink or added as a coating afterwards: graphene derivatives are increasingly exploited in electrochemical biosensing, since specific oxidized moieties are well exposed to the surrounding environment and they are responsible for the activation of electrocatalytic processes toward several species, i.e. a decrease of the oxidation or reduction potentials of the analyte with respect to pristine carbon electrodes [1]. We report the advantages in the use of graphene paper (G-paper) for the realization of unfunctionalized, ready-to-use electrodes on flexible plastic and textile supports, as well as their application as wearable (bio)sensing platforms (Figure 1). G-paper is a flexible, electrically conductive, paper-like material which has a large surface area and can be shaped in different ways; it features a high electrical conductivity ($1x10^5$ $Sm^{-1}$), mechanical and chemical stability even after one million bending times [2]. We demonstrate that G-paper electrodes can be successfully employed in wearable biosensing platforms: a comparison with graphite-based commercial electrodes demonstrates that our novel, unfunctionalized devices outperform them in sensing of nicotinamide adenine dinucleotide (NADH), a key molecule for enzymatic biosensing; in addition, thanks to the stable deposition of lactate dehydrogenase for enzymatic detection of lactate, we also demonstrate the possible advantages in the use of these new devices with respect to those present on the market, opening new possibilities for comprehensive smart fabrics in wearable electronic applications.

## References

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## Figures

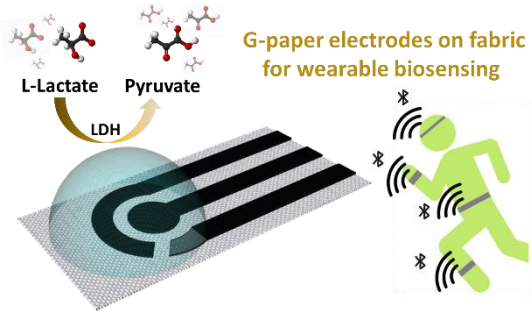


**Figure 1.** G-paper electrode on cotton fabric and exemplificative application for biomarkers detection during training.