chem2Dmat
European Conference on Chemistry of Two-Dimensional Materials

Functionalized Graphene Oxide as sensing element for the amperometric detection of Na^+ and K^+ in sweat

Ilenia Bracaglia,[1] Laura Malavolta,[1] Lorenzo Tomasi,[1] Chiara Zanardi,[1,2] Vincenzo Palermo[1]

[1]Institute for Organic Synthesis and Photoreactivity (ISOF), National Research Council of Italy (CNR), Via P. Gobetti 101, I-40129 Bologna, Italy

[2]Ca' Foscari University of Venice, via Torino 155, 30170, Venezia

ilenia.bracaglia@isof.cnr.it

Recent events have shown the need to develop new wearable sensing devices for continuous monitoring of biomarkers present in sweat or saliva, as well as of giving early detection of specific diseases. However, the detection of biomolecules in complex biological fluids is not trivial, due to low concentrations, the presence of a huge number of interfering species and of the great variability of the composition of the matrix. Conventional electrochemical biosensors base their detection in the selective recognition of specific analytes, and this limits their reliability. For this reason, we are focusing our attention on the realization of a **multisensor platform** which achieves quantitative detection of the analytes by combining the responses from different sensors and elaborating them using a deep learning approach (Fig. 1).

As work in progress, we describe here a multisensor platform for the quantification of Na^+ and K^+, which are main electrolytes present in sweat. The detection of these species, generally performed by a potentiometric transduction, is here demonstrated for the first time with an amperometric approach combined with a deep-learning algorithm. The sensing strategy takes advantage of the peculiar properties of graphene oxide when acting as the sensing element in amperometric sensors: the versatility of this material is here exploited for the stable anchoring of selected receptors, namely metal hexacyanoferrates [1] and crown ethers [2], involved in the recognition of Na^+ and K^+.

References

[1] P. J. Kulesza et al. *Electrochim. Acta* 40 (1995) 681; N. Bagkar et al. *Thin Solid Films* 497 (2006) 259. A. A. Karyakin, Electroanalysis, 13 (2001) 813.

[2] S. Bhandari et al. *Electroanalysis* 31 (2019) 813; S. Kumbhat et al., *J. Electroanal. Chem.* 809 (2018) 31.

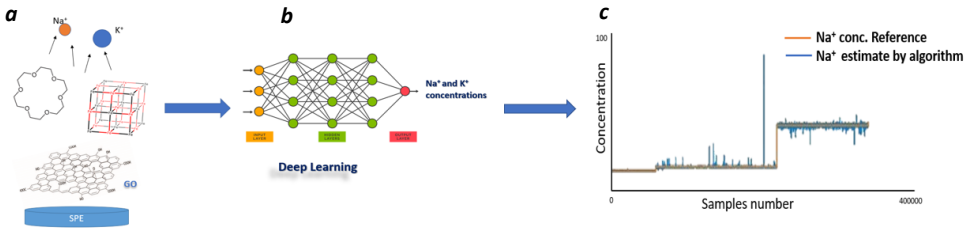

Figure 1: sensing strategy by deep learning involving *a)* development of screen-printed electrodes (SPE) involving functionalized graphene oxide, *b)* elaboration of the amperometric responses by artificial neural network, *c)* verification of the accuracy of the prediction models.

Commentato [VP1]: Il grafico sembraba quasi vuoito, sostituisci con uno zoom-in in cui si vedere un gradino, ma in più dettaglio.