CuO-doped alginate for simple electrochemical Vitamin C sensing in sweat

Bergoi Ibarlucea[1,2], Arnau Perez Roig[1], Dmitry Belyaev[1], Larysa Baraban[1,2], Gianaurelio Cuniberti[1,2]

1. Institute for Materials Science and Max Bergmann Center of Biomaterials, Technische Universität Dresden, Dresden, Germany.
2. Center for advancing electronics Dresden (cfaed), Technische Universität Dresden, Dresden, Germany.

Heat-exposed work activities or prolonged sport sessions suppose a continuous nutrient loss through sweating, leading to long-term health issues [1]. Among prevention steps, the use of miniaturized sensors for real time monitoring of micronutrient presence directly in sweat can be of great interest. Here, we propose a flexible sensor for detection of vitamin C (ascorbic acid), based on a very simple process of electrode modification via electrodeposition of alginate [2] membrane containing CuO nanoparticles. The reductive effect of ascorbic acid on the nanoparticles produces a shift of the redox peaks in cyclic voltammetry analysis, which can be measured at nearly zero volts as a current increase by amperometry. The detection is performed efficiently at the micromolar ascorbic acid levels found naturally in sweat and works at ultra-low potential (-5 mV), showing no interferences with other typical molecules found in the samples. In combination with sensors for other nutrients, this can be a promising approach for preventive healthcare applications.

[1] Tang, Y.-M.; Wang, D.-G.; Li, J.; Li, X.-H.; Wang, Q.; Liu, N.; Liu, W.-T.; Li, Y.-X. Relationships between Micronutrient Losses in Sweat and Blood Pressure among Heat-Exposed Steelworkers. *Ind. Health* **2016**, 54, 215–223.

[2] Márquez, A.; Jiménez-Jorquera, C.; Domínguez, C.; Muñoz-Berbel, X. Electrodepositable Alginate Membranes for En-zymatic Sensors: An Amperometric Glucose Biosensor for Whole Blood Analysis. Biosens. Bioelectron. 2017, 97, 136–142.