Single-step Modified Electrodes for Ascorbic Acid Detection in Sweat at Ultralow Potential

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We present an electrochemical sensor for the detection of ascorbic acid (AA) in sweat at ultralow potential. The sensor is based on gold electrodes modified by one-step electrodeposition of an alginate membrane where CuO nanoparticles are trapped. AA is a known reducing agent of nanostructured copper[1], and the effect is seen as a shift of the redox peaks to a positive voltage (Figure 1a). By measuring at nearly zero volts (-5 mV), the approaching of the reduction peak to this value can be detected as a growing negative current. We perform the detection of the relevant micromolar levels (Figure 1b) in neutral buffer as well as in artificial acidic sweat. The sensor does not show any cross-reactivity with typical species found in sweat such as lactic acid, glucose, urea, pyruvic acid, glutamic acid, and uric acid, showing an excellent specificity. As a nonenzymatic approach, the stability is not as compromised and the cost is reduced. Easy removal of alginate by a calcium-quelating buffer makes it possible to reuse the electrodes with a different membrane composition on-demand[2]. Finally, the sensor is fabricated on Kapton foils, an appropriate material for the construction of flexible sensors[3] that enables future integration on wearable devices for monitoring of sweat parameters and nutrient loss.

References

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[3] D. Karnaushenko et al., *Adv. Healthc. Mater*. **2015**, 4, 1517–1525

Figure

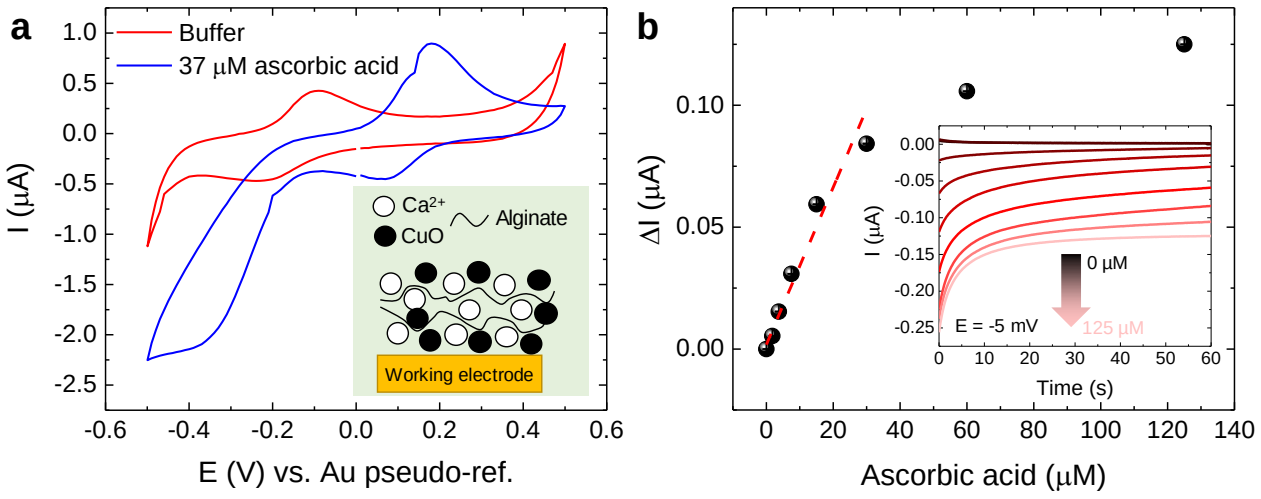

Figure 1. Ascorbic acid sensing with alginate/CuO-modified electrodes. (a) Effect of the ascorbic acid on the cyclic voltammogram of the sensor. Inset shows the composition of the membrane. (b) Calibration. Inset shows amperometric response at -5 mV.