graphenano SENSORS

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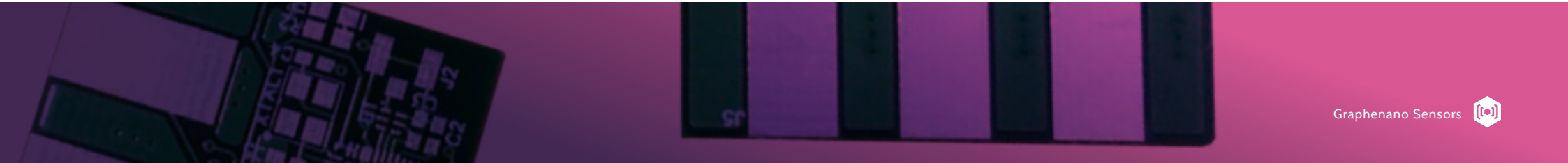
nanotechnologies

INTRODUCTION

Diabetes is a chronic disease with overwhelming human, social and economic consequences. It is caused by an inefficient insulin production or secretion, which impedes the cells´ ability to digest glucose from blood. Seven million people develop diabetes annually and the World Health Organization (WHO) has concluded that there will be a 50% increase over the next decade in the number of deaths.

Although there is no way to cure or prevent diabetes, appropriate monitoring and quantification of glucose levels can improve treatment efficiency and make patient lifestyle simpler.

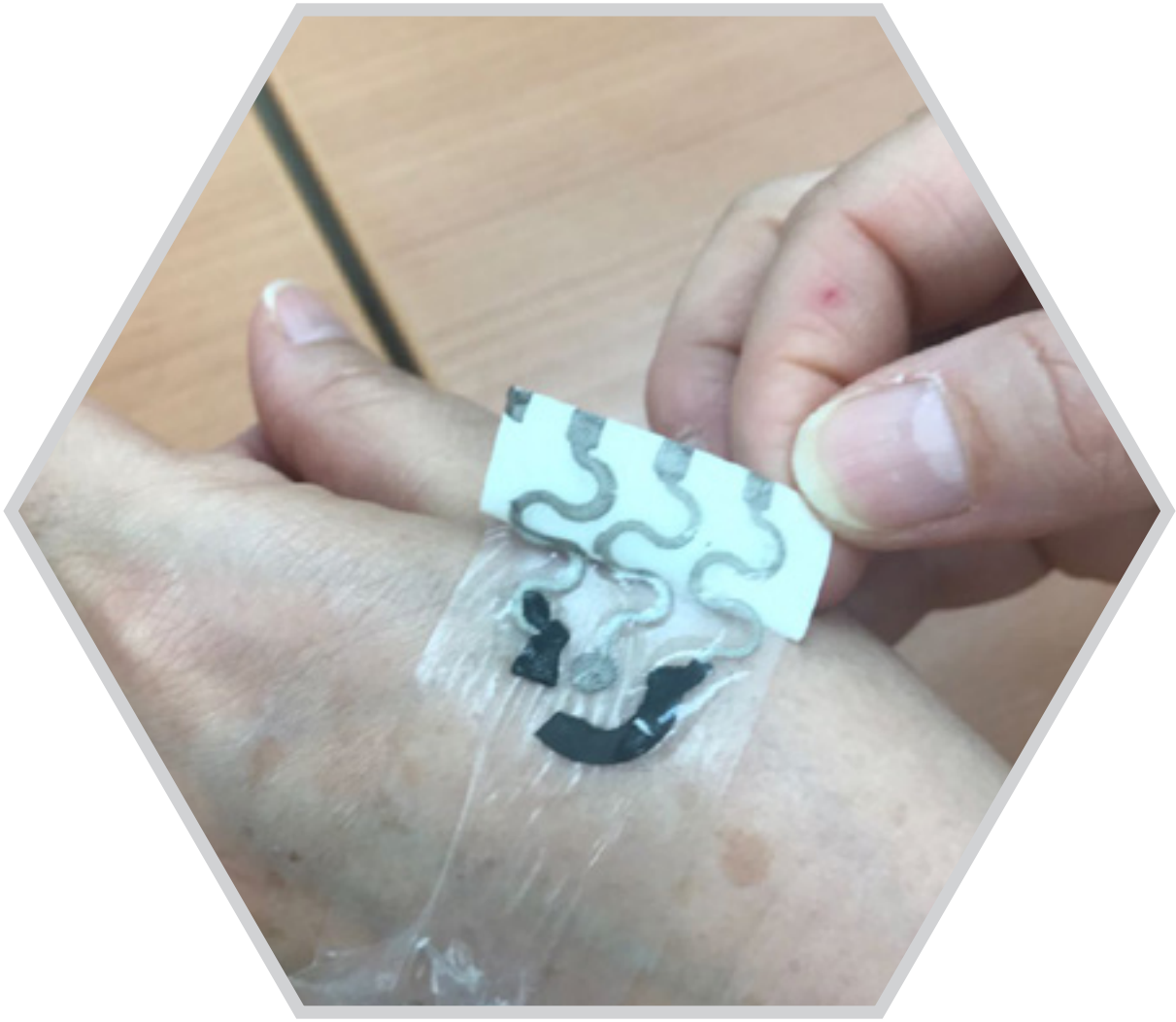


Therefore, major scientific attention is dedicated towards developing non-invasive glucose monitoring diagnostic tools. Human perspiration offers valuable information about the health status depending on the levels of glucose and there is a correlation between glucose levels in blood and perspiration for diabetic patients. This table shows the glucose levels of glucose found in several physiological fluids.

Fluid	Glucose levels
Blood	(4.4-6.6) mM
Urine	(2.8-5) mM
Perspiration	5.6 µM-2.2 mM
Saliva	(20-240) µM
Tears	(0.2-0.8) mM

Electrochemical biosensors have acquired substantial interest for detection and quantification of glucose. The most of them are based on GOx, a dimeric glycoprotein consisting of two identical polypeptide chain subunits, one of which contains flavin adenine dinucleotide cofactor (FAD), the active center where glucose oxidation takes place.

$$Glucose + GOx(FAD) \rightarrow Gluconalactone + GOx(FADH_2)$$



H_2O_2 REDUCTION

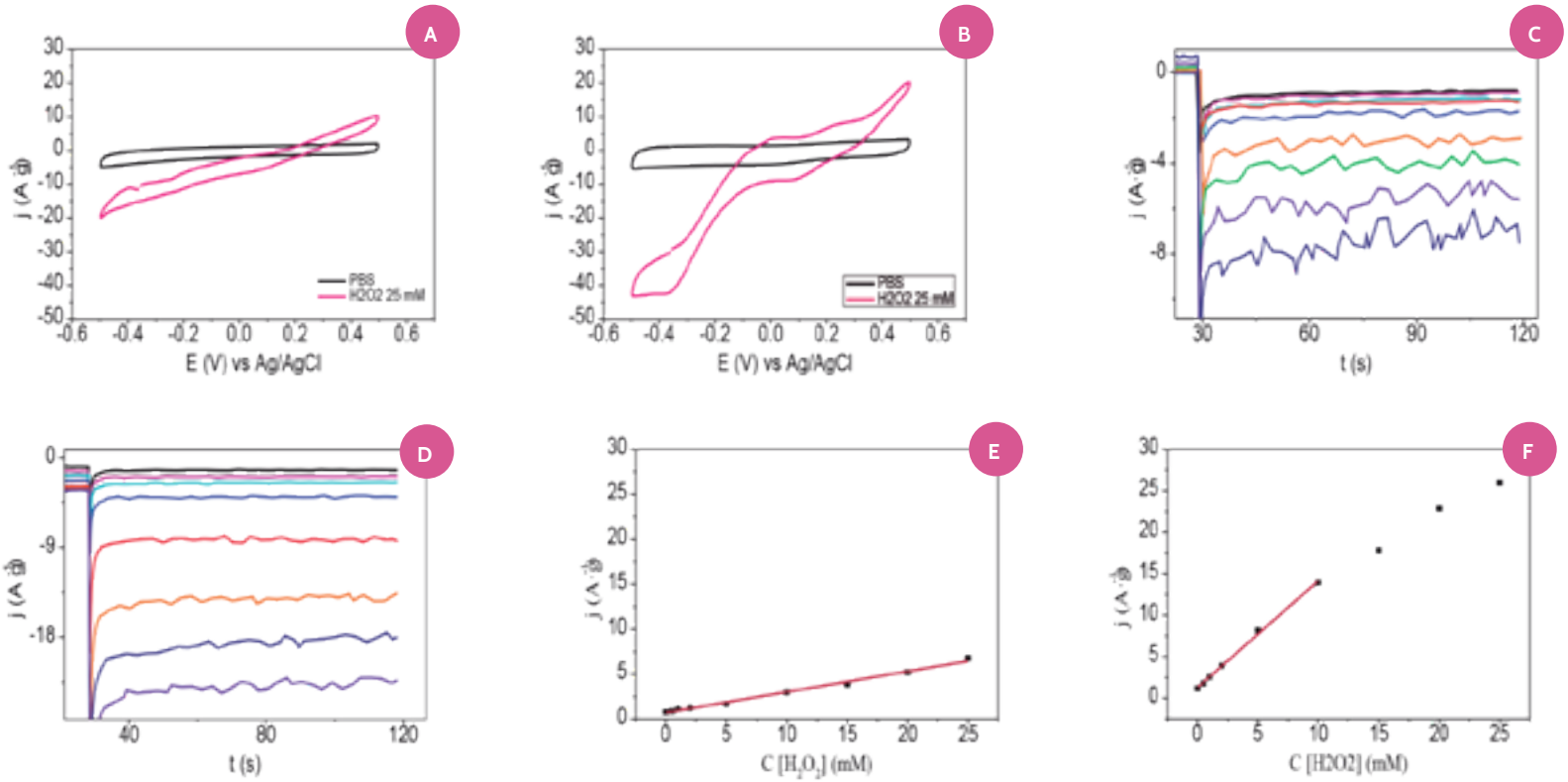
First of all, the behavior of the materials (T1 and T2) was evaluated towards H_2O_2 reduction. For that, electrodes of both materials (T1 and T2) were prepared, whose total weight was 10 µg.

INKS

Graphenano Sensors has prepared aqueous and stable inks, which have been printed in several substrates, whose resistance values assess a suitable electrochemical measurement. These inks, easily produced by Graphenano, will be able to make millions of electrodes at a market price.

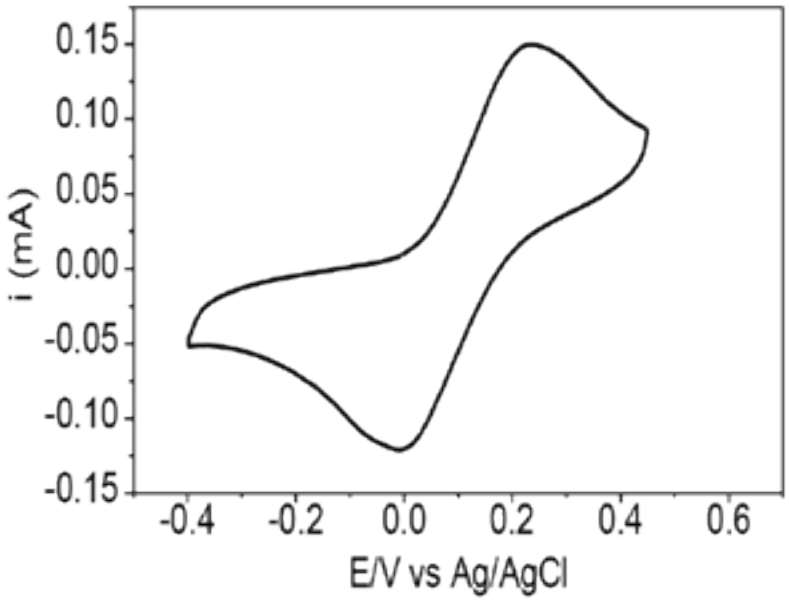
Having a high catalytic power, this ink may favor the development of other type of biosensors for various medical applications.

RESULTS OBTAINED FOR H_2O_2 REDUCTION

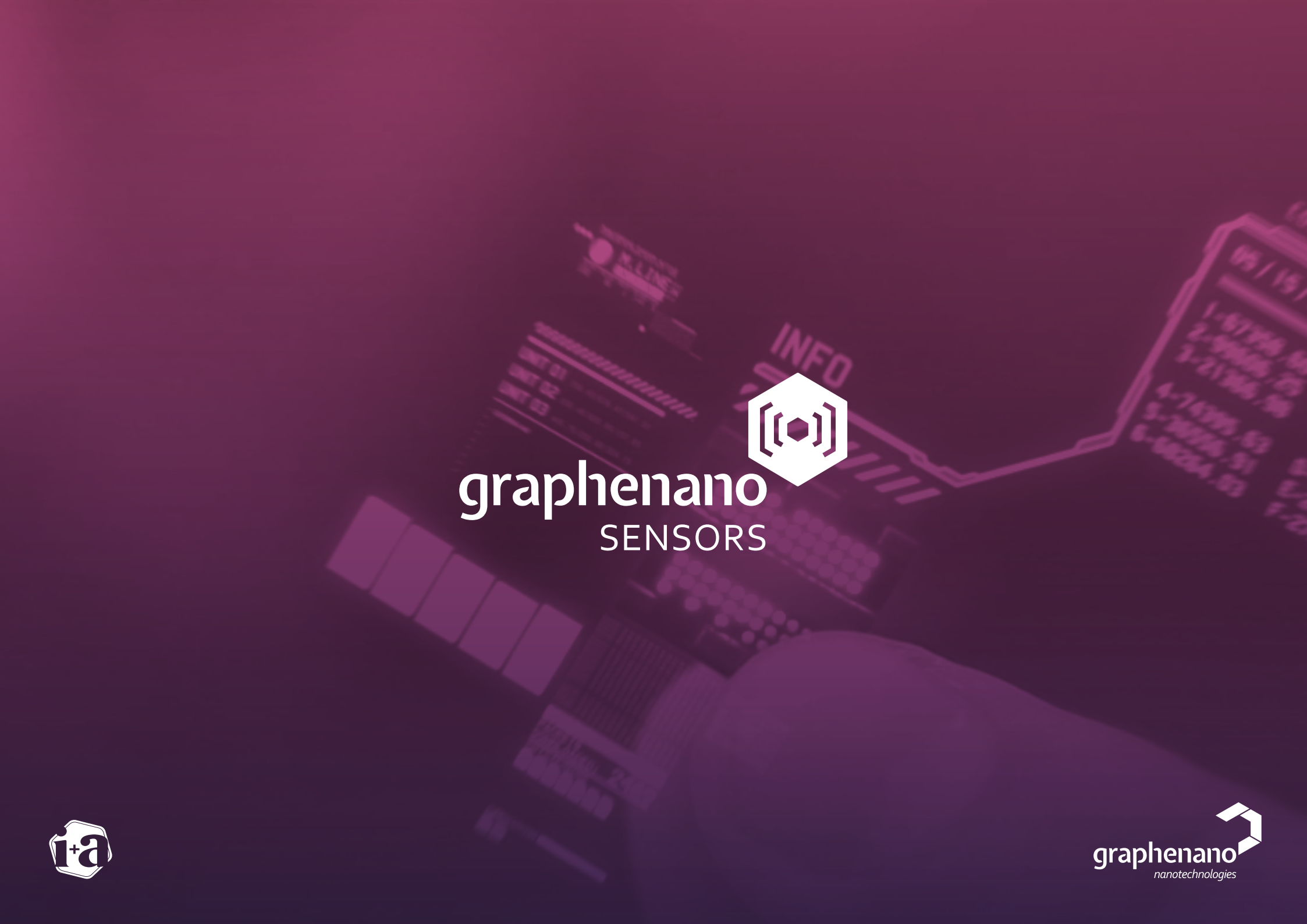


A-B) Cyclic voltammetry for T1 and T2 samples, respectively. C-D) Chronoamperometry at -0.3 V for H_2O_2 concentrations between 0.5 and 25 mM, for T1 and T2, respectively. E-F) Calibration curves obtained for T1 and T2, respectively.

CYCLIC VOLTAMMETRY



Voltammograms of printed line-electrodes in a 10 mM K4[Fe(CN)6] solution.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