

Electrochemical Insulin detection

Lucia Grassi^a, Sandro Carrara^a, Fabrizio Mastrantonio^b, Francesco Valgimigli^b, Paolo Cappa^c, Giovanni De Micheli^a

^aLaboratory of Integrated Systems, EPFL - École Polytechnique Fédérale de Lausanne - Lausanne, Switzerland

^bA. Menarini Diagnostics, Florence, Italy

^cDepartment of Mechanical and Aeronautical Engineering, Faculty of Engineering, Sapienza University of Rome, Rome, Italy

Aim of the project

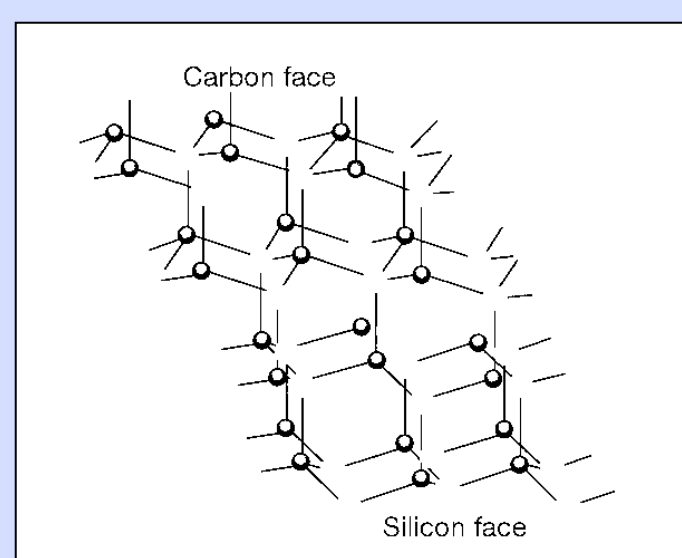
The development of a stable sensor for Insulin measurement is necessary for the purposes of monitoring and personalized therapy in patients with metabolic syndrome such as Diabetes Mellitus. To this goal, is right to explore innovative procedures based on nanostructured electrodes which have been successful in improving sensing performance in the case of other biomolecules.

This improvement is due to the two fundamental properties of nanostructures:

- Increase the active surface of the electrode
- Efficient *Electron Transfer* from the redox active site of the metabolite (or of the enzyme in other cases) to the electrode

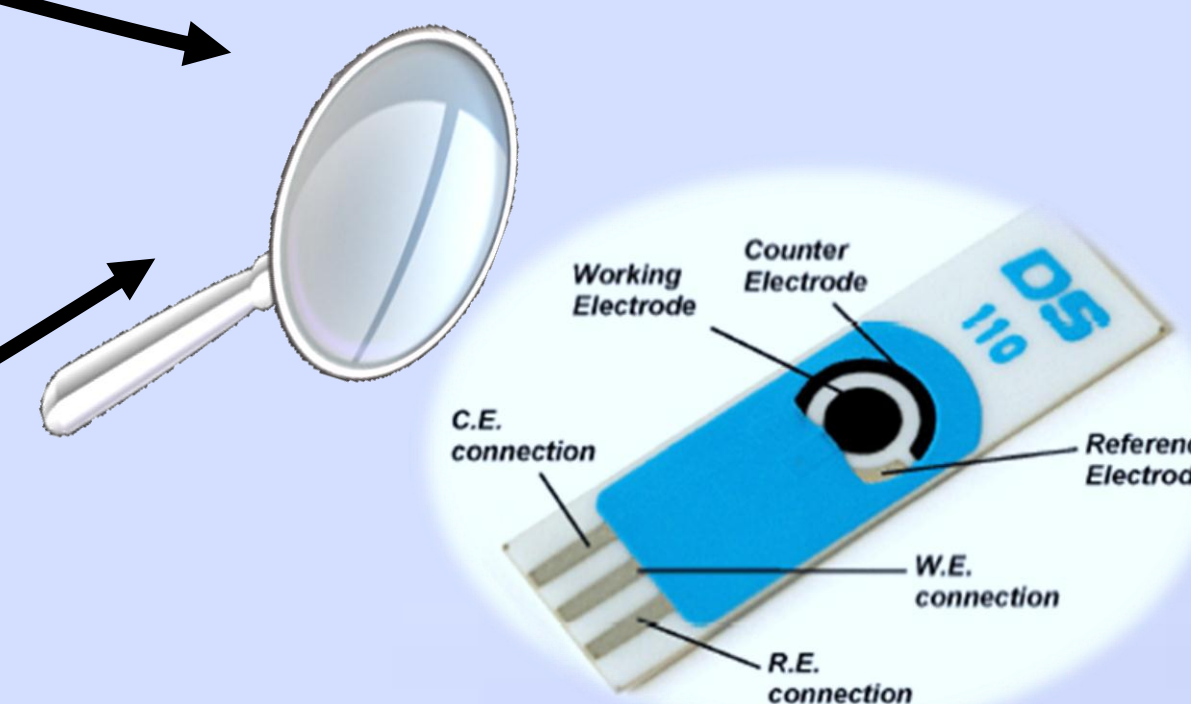
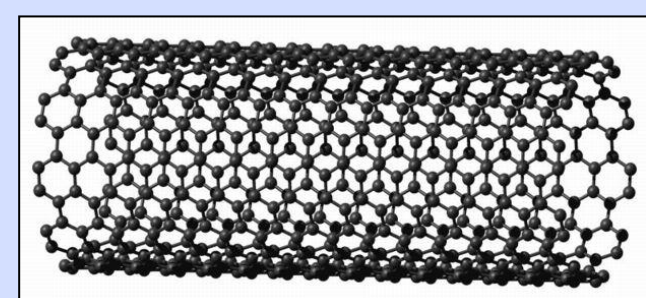
Materials & methods

Silicon Carbide Nanoparticles (SiC NP)

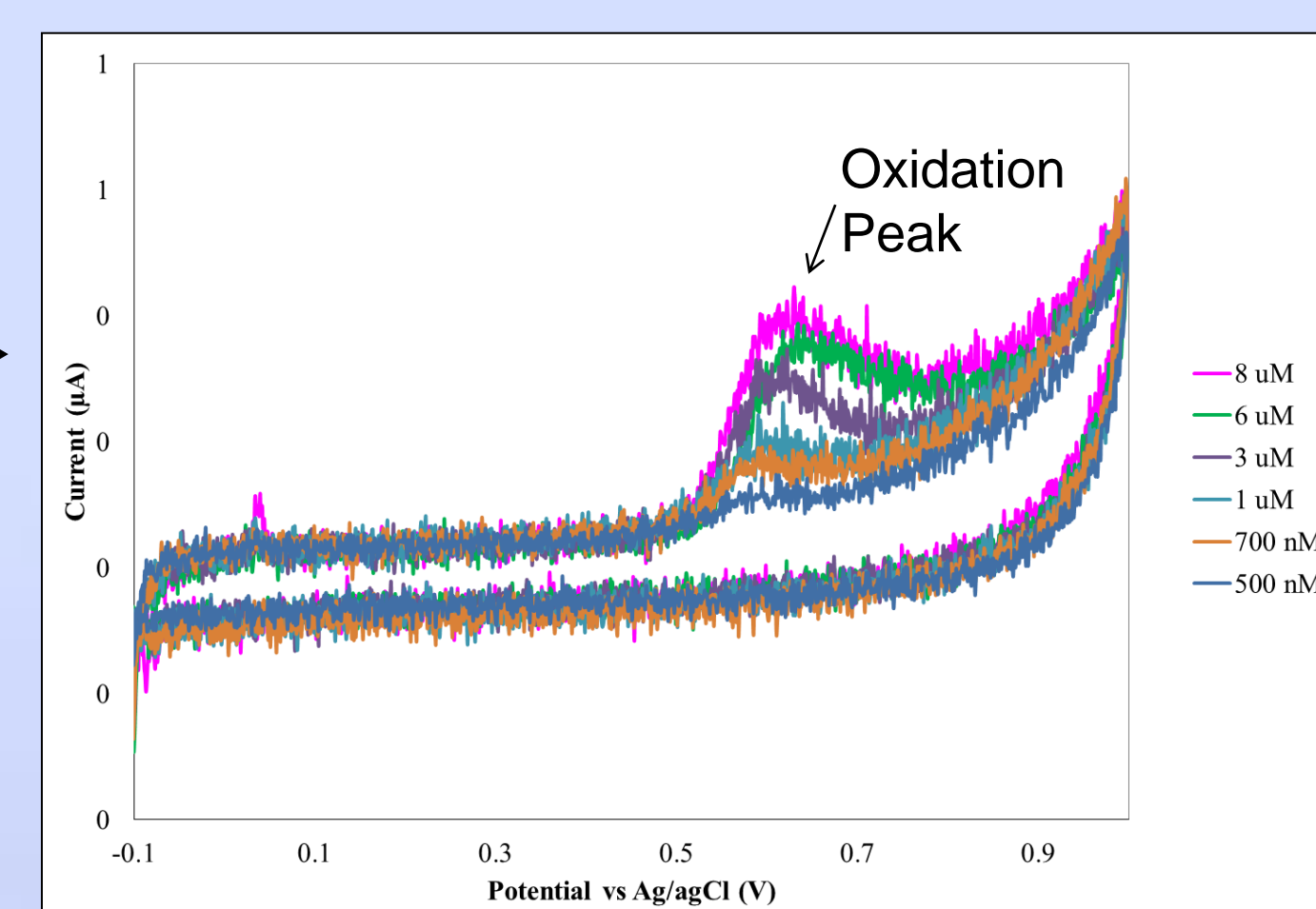


Drop-casting

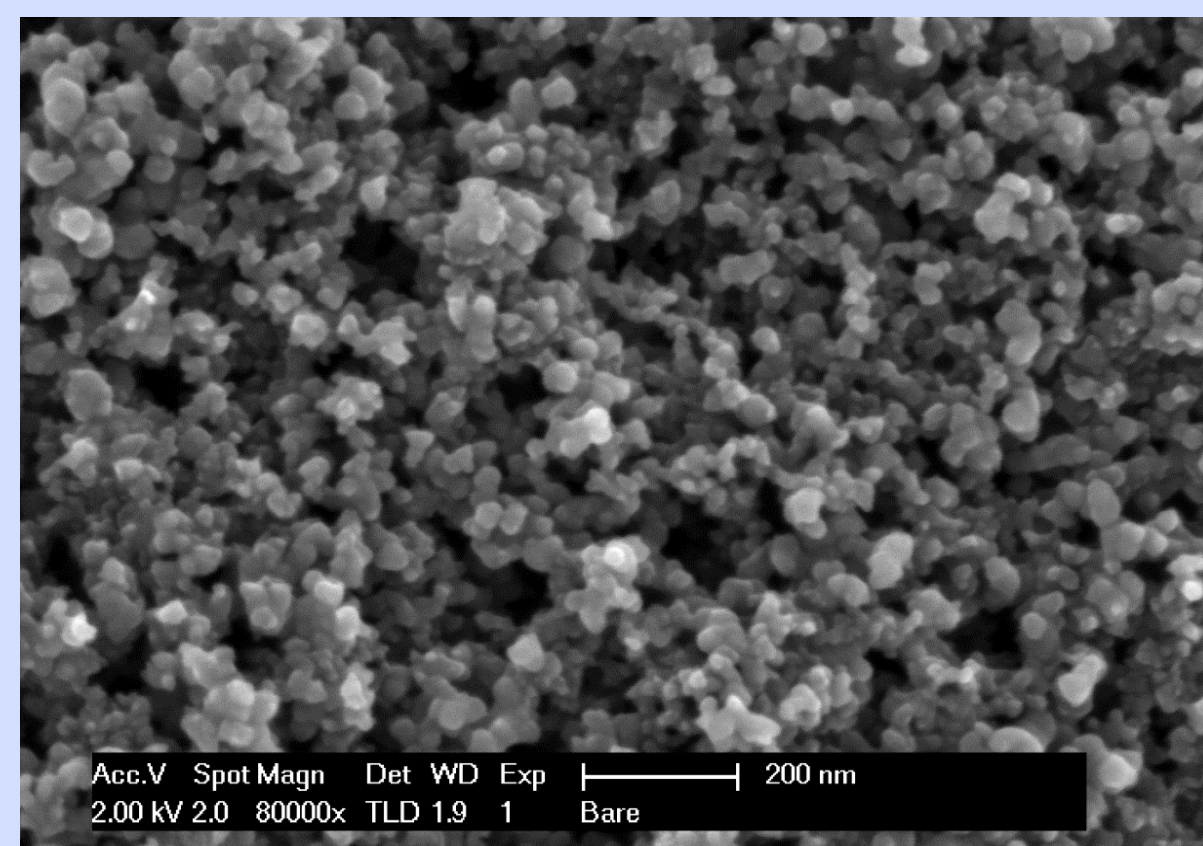
Multi-walled carbon nanotubes (MWCNTs)



Cyclic
Voltammetry
Analysis

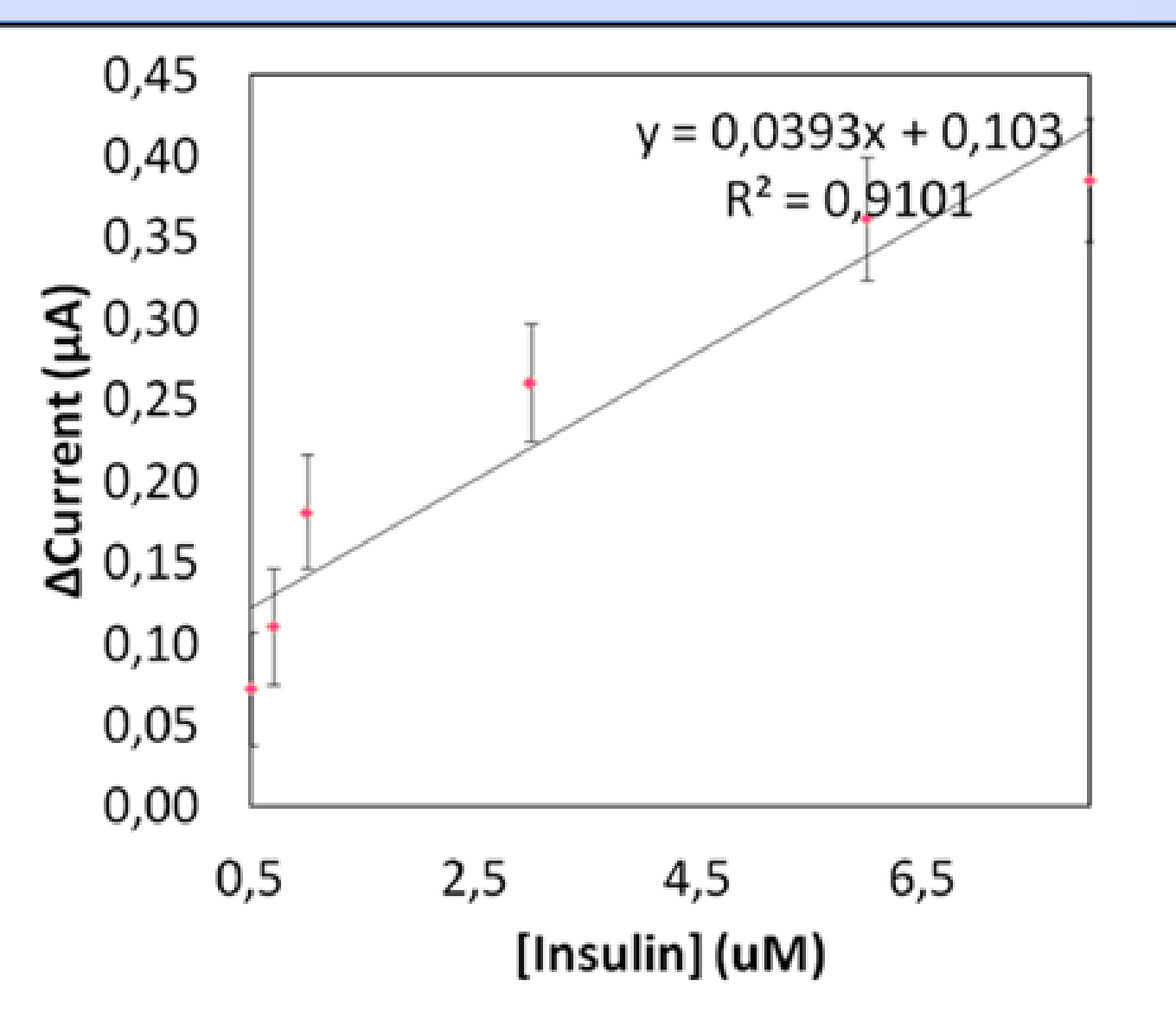


Bare graphite disposable electrodes

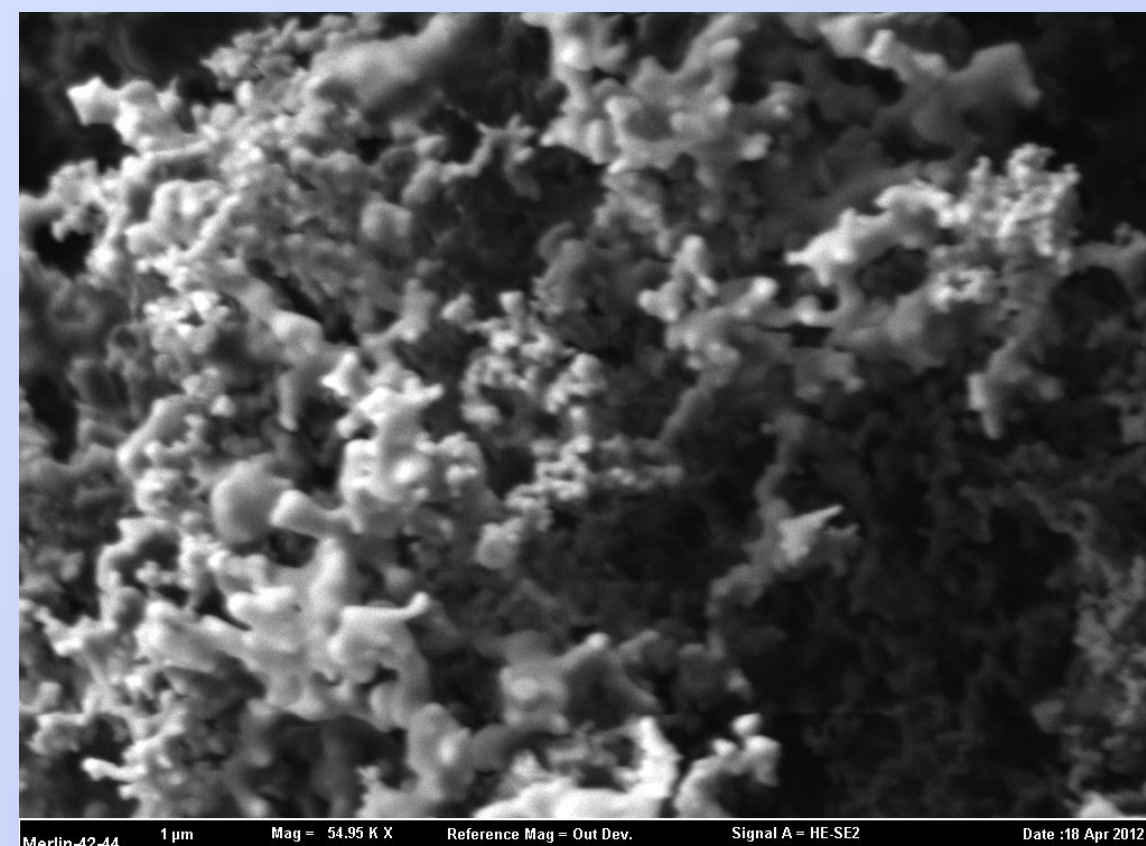


Range: 0-8 µM [1]

Sensitivity (µA/(cm ² mM))	295.67±43.15
Detection limit (µM)	0.97±0.13

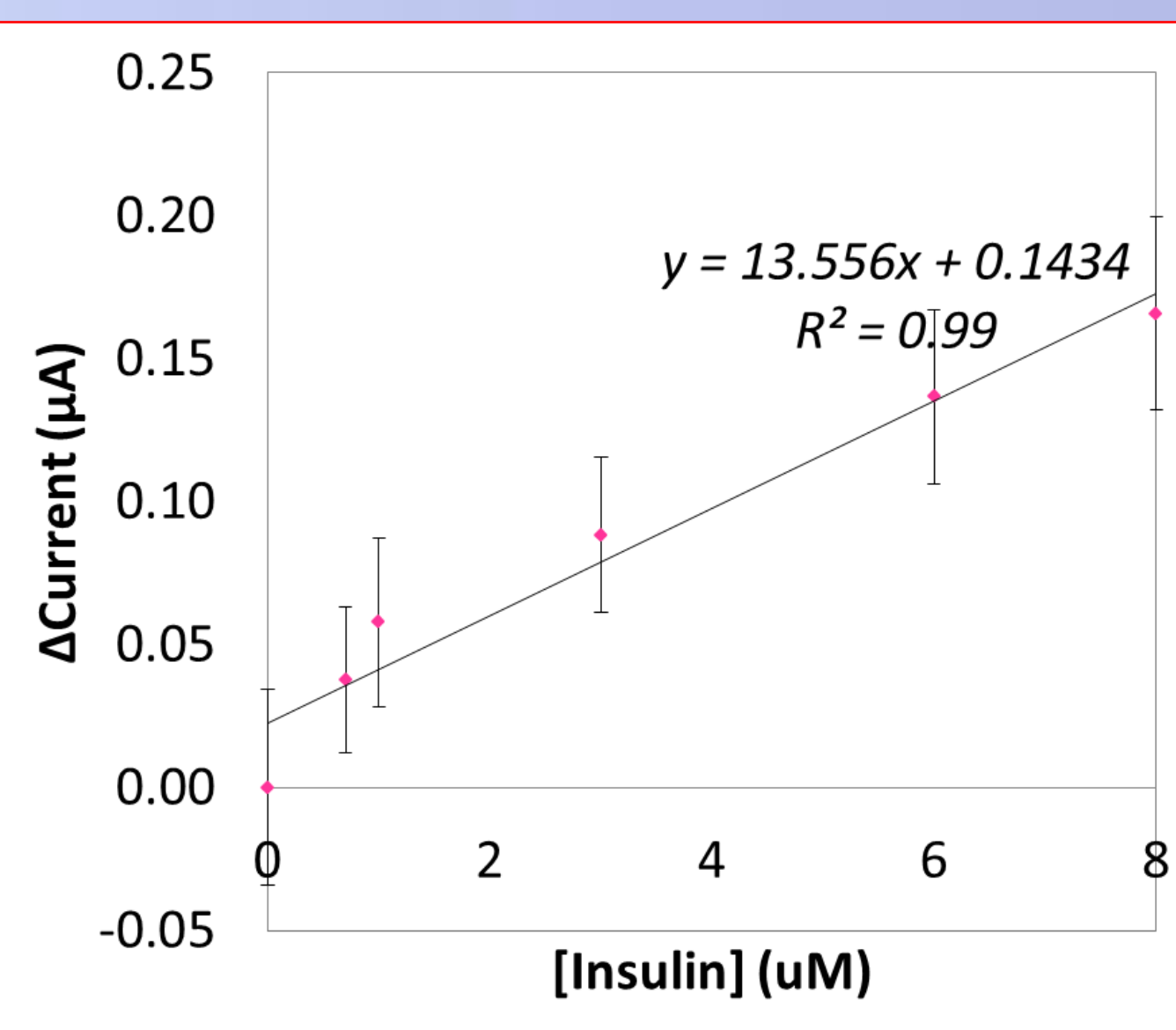


Graphite-SiC NP disposable electrodes

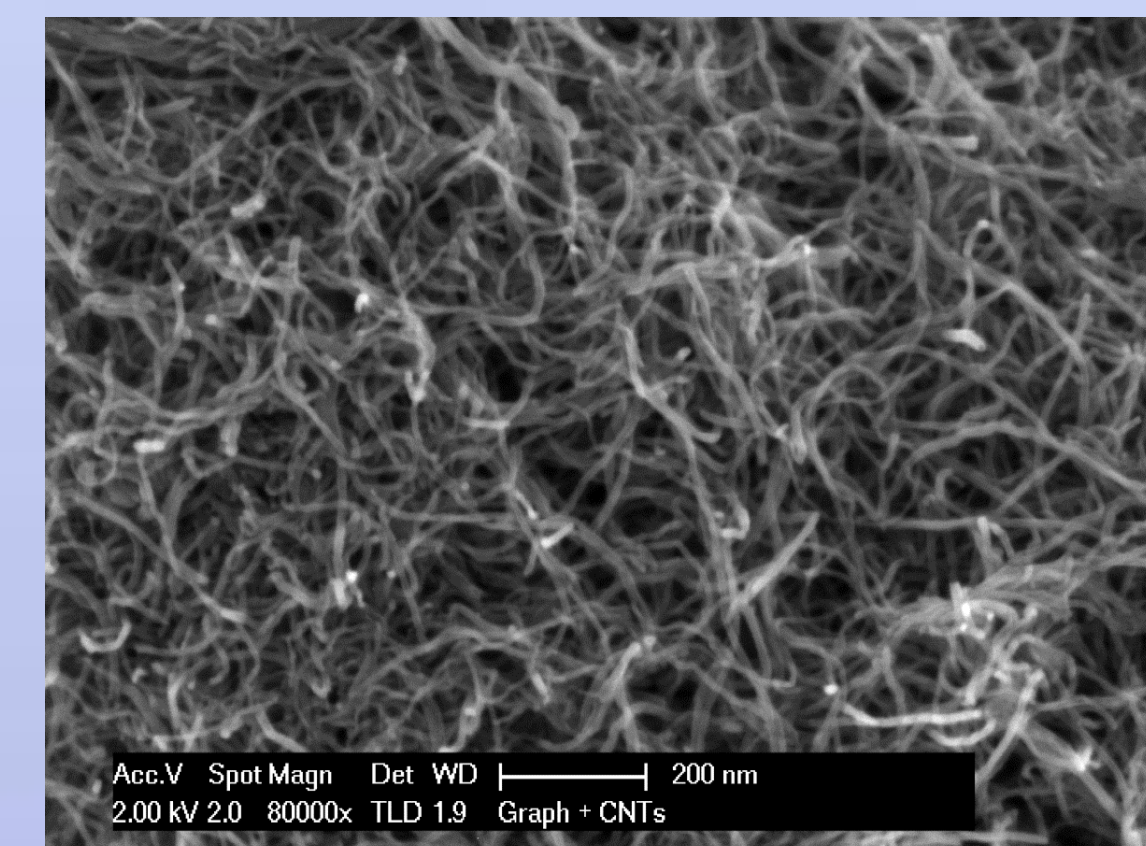


Range: 0-8 µM [1]

Sensitivity (µA/(cm ² mM))	147.05 ± 37.06
Detection limit (µM)	1.84 ± 0.46

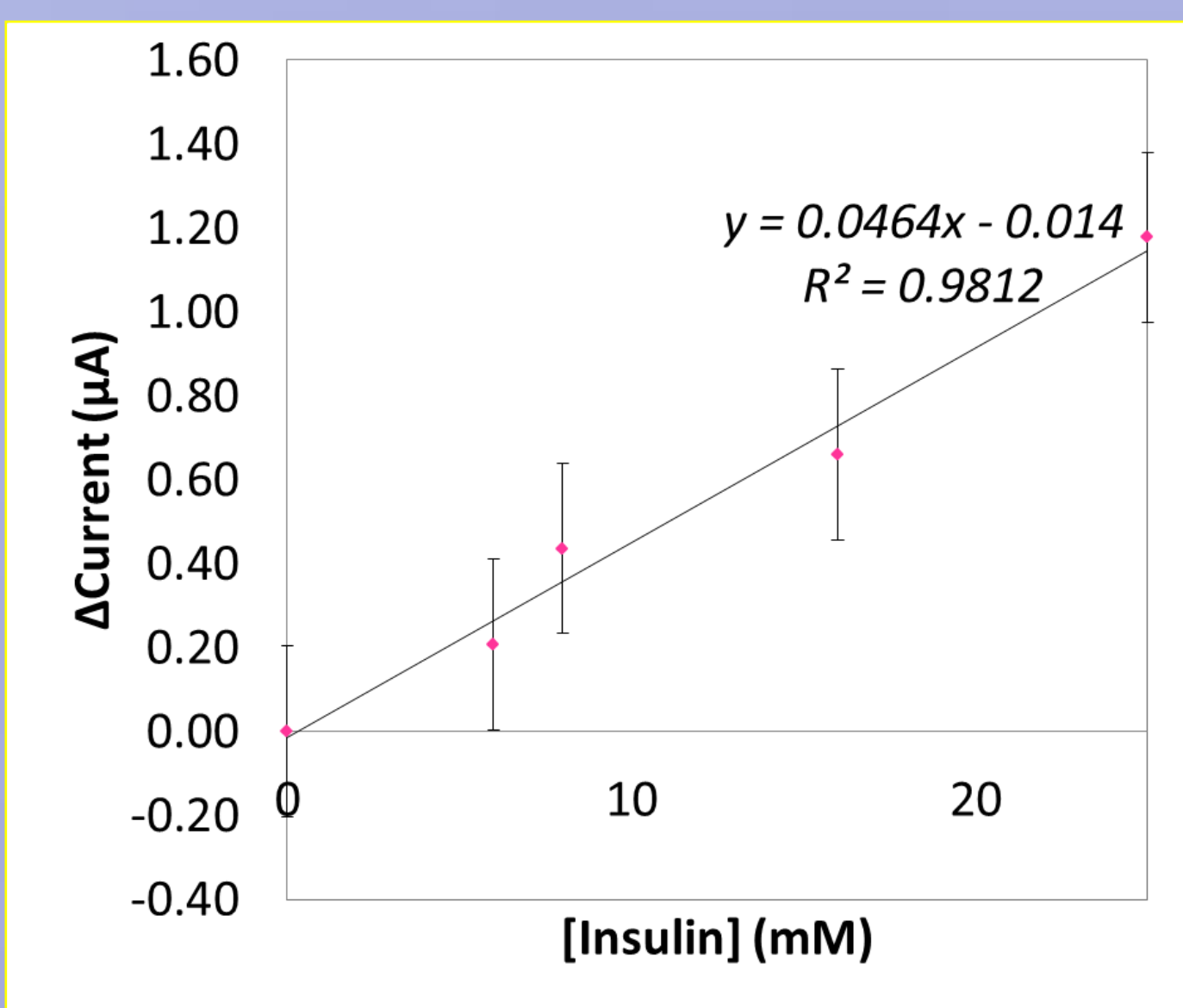


GrphiteMWCNTs disposable electrodes



Range: 0-25 µM [1]

Sensitivity (µA/(cm ² mM))	437.67±236.21
Detection limit (µM)	1.33±0.4



Conclusions

We fabricated different nano-structured Screen Printed Electrodes by drop-casting free-binder nano-materials .

In presence of *Multi-Walled Carbon nanotubes (MWCNTs)* we obtained the best performance in terms of **Linear Dinamic Range** and **Sensitivity**.