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Proceeding Paper

Aptamer-Based Label-Free Electrochemical Biosensing Platformfor Glycated Hemoglobin Detection †

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1. Aptamers

- Artificial single stranded oligonucleotides DNA or RNA
- Selected in vitro by SELEX
- Able to fold into 3D structure
- High affinity and specificity for target
- molecules Stability and reusability
- Easily chemical modification

2. Glycated Hemoglobin (HbA1c)

- Resulting from binding of glucosemolecules to hemoglobin which is responsible of the gas exchanges;
- Reflects the level of glucose in blood fora long period (up to three months);
- Faithful biomarker for in vitro diabetes diagnosis.

3. Immobilization Method

- GCE was modified with Goldnanoparticles (AuNPs) and selfassembled L-cysteine (L-cys)
- AuNPs were used to enhance theelectronic properties of the GCE
- AuNPs were coupled to L-cysteine inorder to immobilize the NH_2-aptamer via carboxylic groups and enhance the biosensor performance

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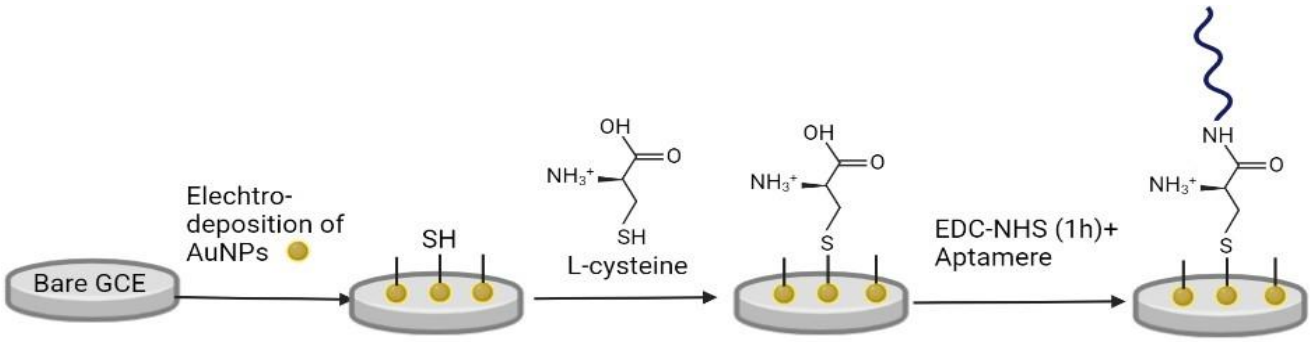
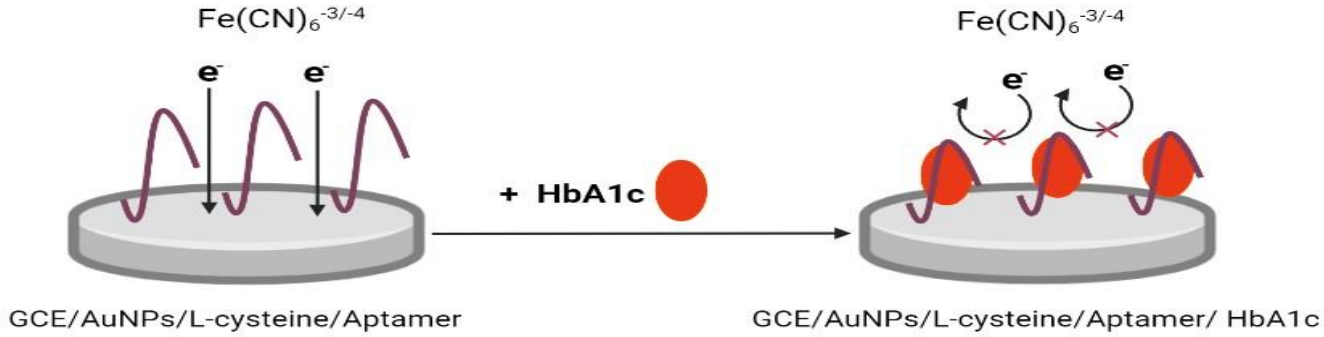
4. Aptamer Immobilization on GCE

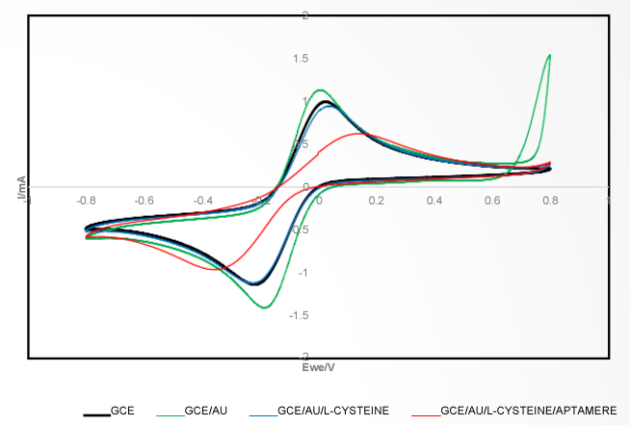


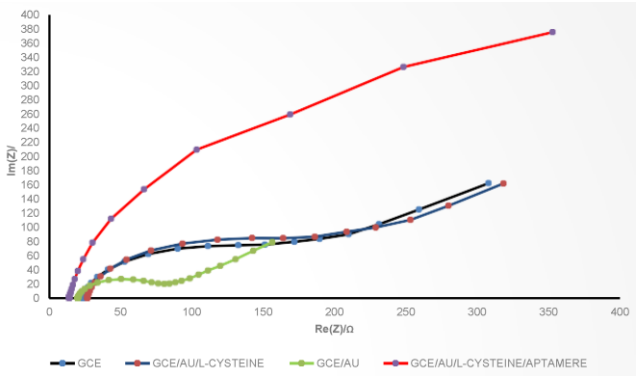
Chronoamperometry for electrodeposition ofgold nanoparticles (400 s, −0.2 V) on GCE; Chemical deposition of L-cysteine (15 h) onGCE/AuNPs; Covalent immobilization of 5′-NH2-HbA1c aptamer on GCE/AuNPs/L-cysteine.



Confromational change of the aptamer for the target binding. The formation of the complex aptamer-HbA1c hinders the electron.

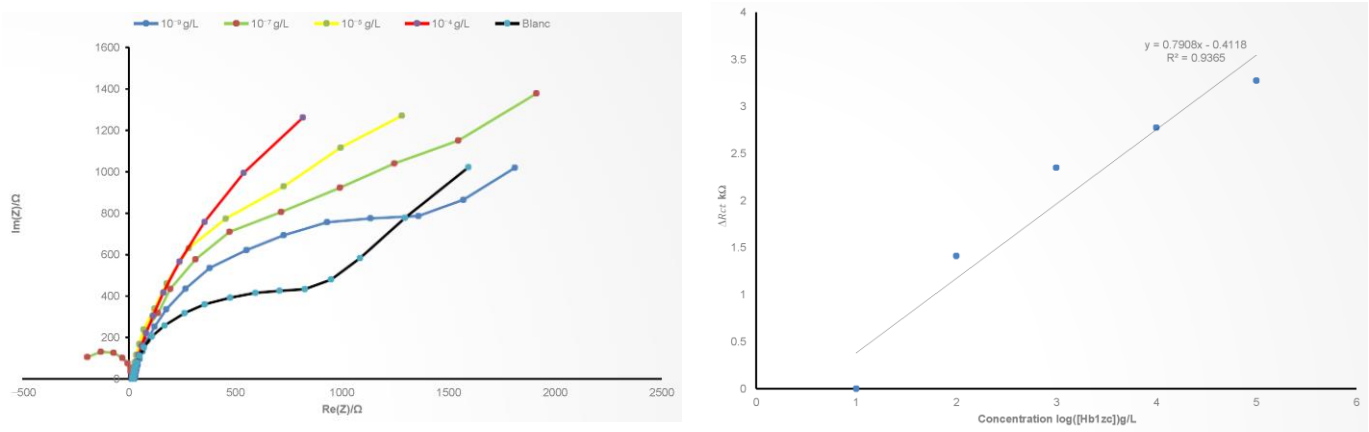
5. Results





Successful immobilization of the aptamer.

- Immobilization of AuNPs was confirmed by the well defined oxidationand reduction peaks as well as the decreased semi cercle wide.
- L-cys and aptamer act as a barrier to the electron transfer resulting in a decrease of the redox peaks



(**a**) (**b**)

(**a**) Nyquist diagram of increasingconcentration of HbA1c; (**b**) Calibration curve.

The electron transfer decreases withincreasing concentrations of HbA1c.

- Good linearity wih R= 0.963
- LoD: 1 ng/mL
- Good applicability of the biosensor

6. Conclusions

- The developed aptasensor allowed the detection of HbA1c with a good limit of detection.
- The Aptamer was succefully immobilized on the L-cys/AuNPs modified GCE. It has yielded to a wide linear response range (10^{-4}–10^{-9} g/L)of HbA1c detection.

7. Perspectives

- The specificity and selectivity of the developed aptasensor will be tested with different interferents and complex matrices.
- The concentration of aptamer will be optimized.
- The reproductibility of the developed platform will be explored.

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