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Gold nanostructure orchestrated electrochemical immunosensor integrated with Antibody-Electroactive Probe Conjugate for rapid detection of SARS-CoV2 antibody

Presented by:

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Outcome

- Synthesis and characterization of gold nanoparticles
- Fabrication and characterization of electrochemical immunosensor for the SARS-CoV-2 antibodies with following analytical performance :

S.No	Parameters	Results
1.	Detection Range	10-100ng/ml; ; Linearity $R^2=0.96$
2.	Sensitivity of the fabricated electrode	$0.013 \times 10^{-3} \text{ mA}(\text{ngml}^{-1})^{-1}$ mm^{-2}
3.	LOD	3.59ng/ml
4.	LOQ	11.38ng/ml
5.	Stability	30 days

Objective 1 Synthesis of Gold nanoparticles and its characterization

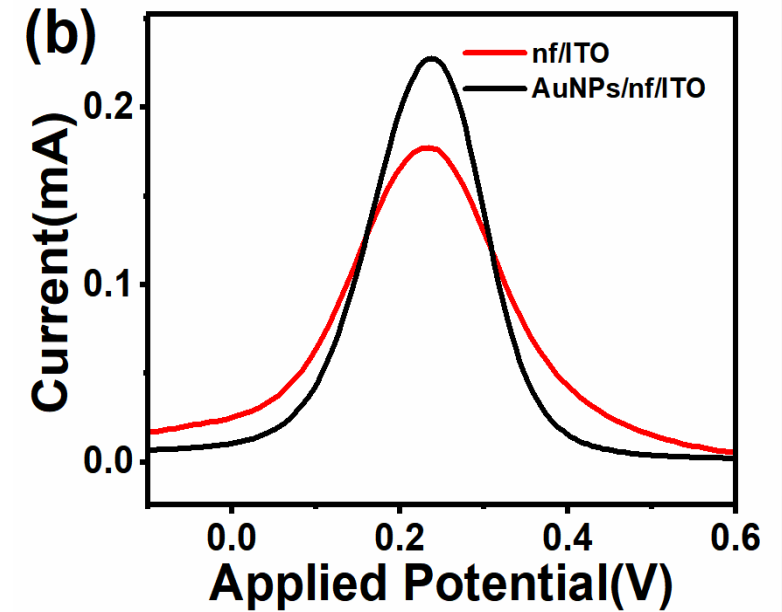
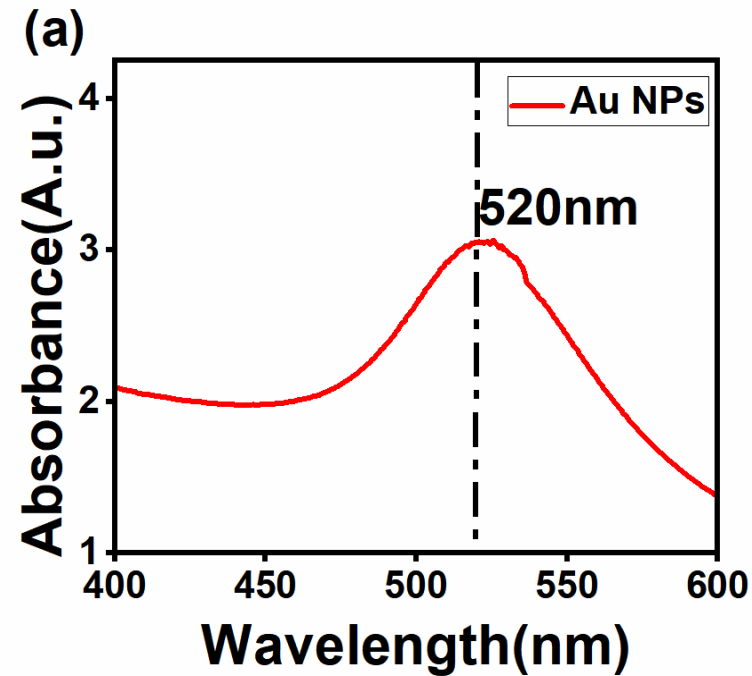


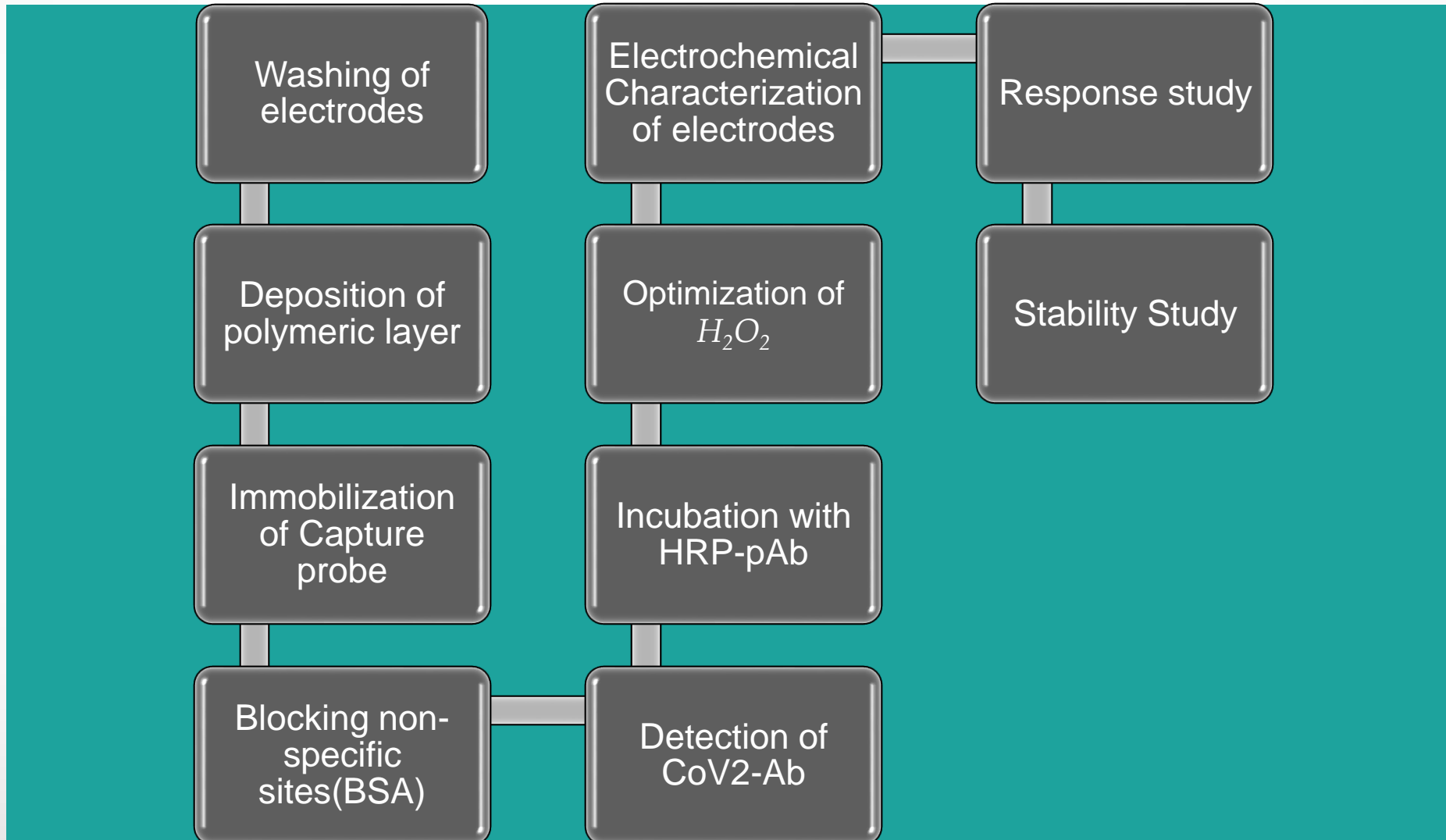
Figure 1: a) UV-Visible spectroscopy of gold nanoparticles. b) Electrochemical characterization of nf/ITO and AuNPs/nf/ITO

Objectives:

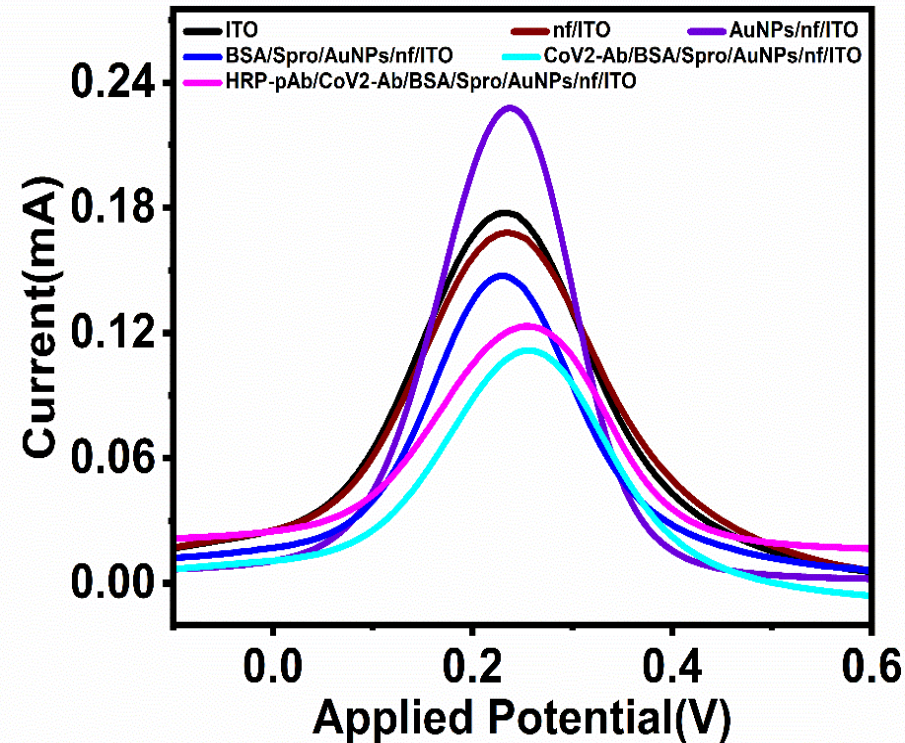


- Synthesis of Gold nanoparticles and its characterization
- Fabrication and characterization of immunosensing probe
- Detection of SARS-CoV2 using the fabricated immunosensor

Objective 2: Fabrication and characterization of immunosensing probe



Electrochemical Characterization of fabricated immunosensor



- Improvement of Surface conductivity using synthesized gold nanoparticles.
- Immobilization of Capture probe Spro and blocking of non-specific binding sites using BSA
- Detection of SARS-CoV2 antibodies (CoV2-Ab)
- Improvement in response and detection using HRP tagged secondary antibody

Figure 2: Electrochemical characterization of the fabricated, HRP-pAb/CoV2-Ab/BSA/Spro/AuNPs/nf/ITO immunosensor

Objective:3

Detection of SARS-CoV2 using the fabricated immunosensor

Electrochemical response of different concentration of SARS-CoV2 antibodies on BSA/Spro/AuNPs/nf/ITO

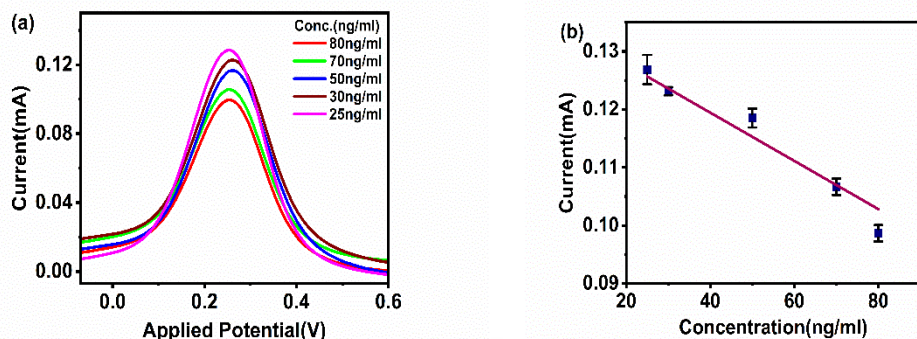


Figure 4: Response study a) Differential Pulse Voltametry b) Calibration curve for the fabricated, BSA/Spro/AuNPs/nf/ITO against CoV2-Ab

Calibration Curve range : 25-80 ng/mL

Electrochemical response of different concentration of SARS-CoV2 antibodies on BSA/Spro/AuNPs/nf/ITO after incubation with HRP tagged secondary antibody

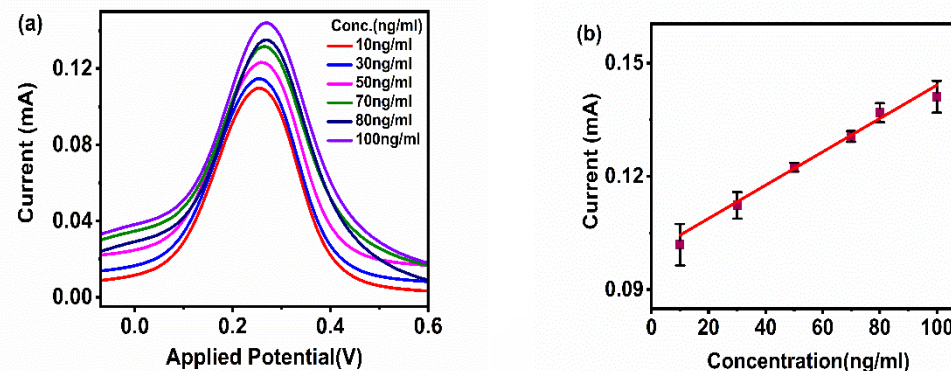


Figure 5: Response study a) Differential Pulse Voltametry b) Calibration curve for the fabricated, HRP-pAb/CoV2-Ab/BSA/Spro/AuNPs/nf/ITO immunosensor against CoV2-Ab

Calibration Curve range : 10-100 ng/mL

Stability Study

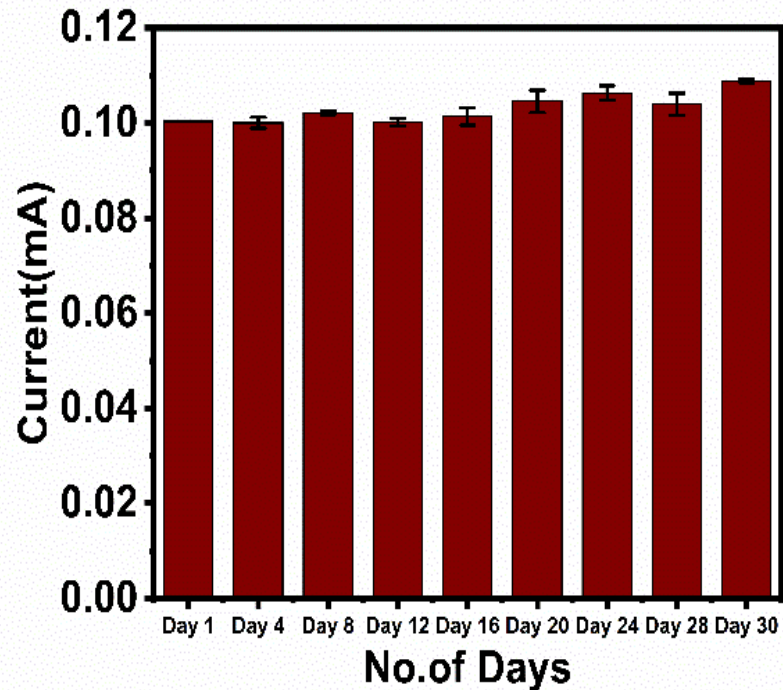


Figure 6: Stability study for the fabricated immunosensor, HRP-pAb/CoV2-Ab/BSA/Spro/AuNPs/nf/ITO

- ❖ Highly stable electrodes for thirty days
- ❖ Show 2-4% deviation till the 20th day.
- ❖ A max of 10% deviation was seen on the 30th day

Conclusion:

- Synthesized and characterized Gold nanoparticles using Turkevich methodology
- Fabricated and characterized a stable, sensitive electrochemical immunosensor for the detection of SARS-CoV2 antibodies

Future Prospects

- Use of Concept to detect different viral proteins
- Miniaturization of the immunosensor for rapid, onsite, quantitative user friendly detection.

