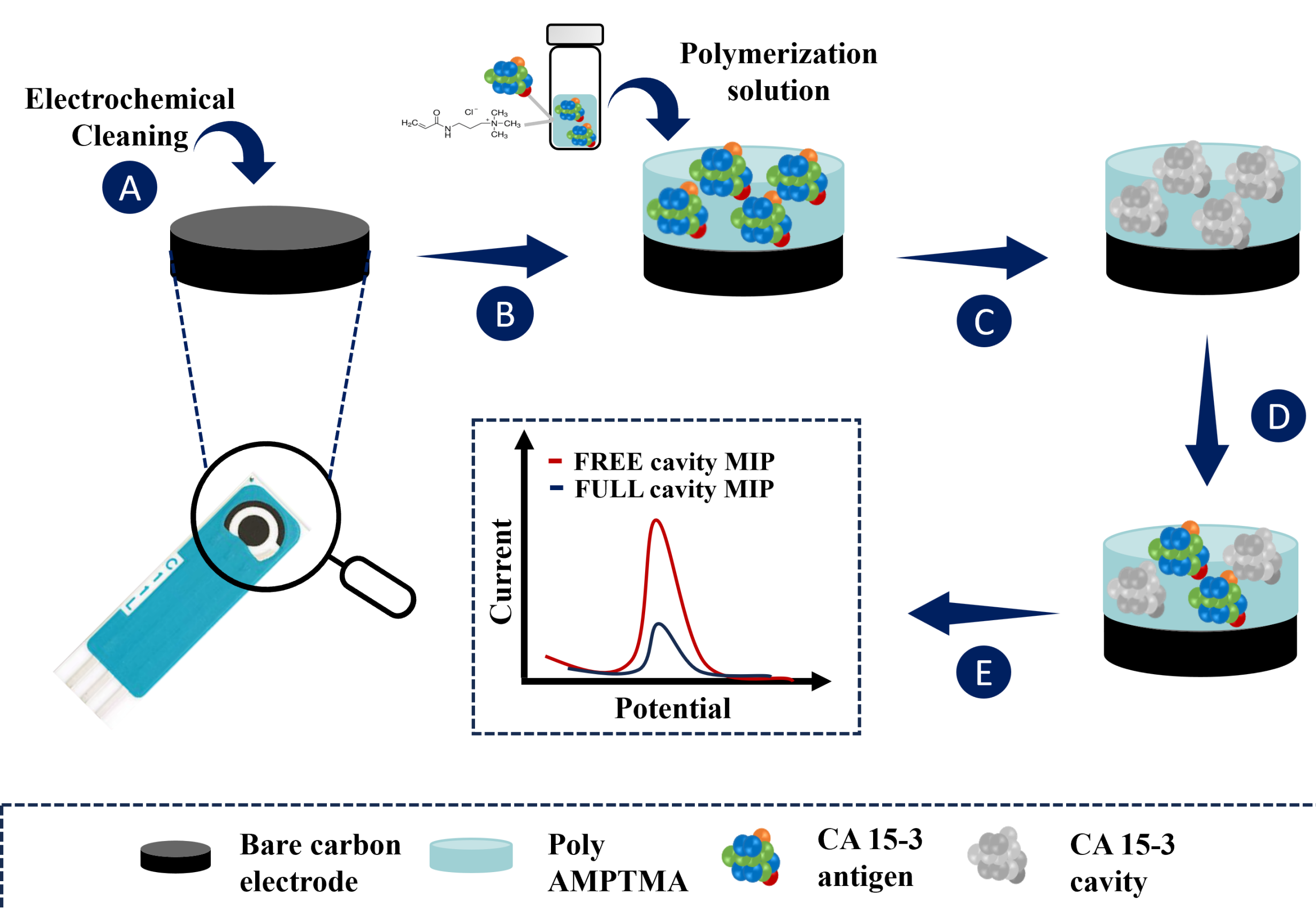


## INTRODUCTION

Cancer is a public health problem worldwide. Early detection is crucial to improve survival rates [1]. Non-invasive, fast rapid, and low-cost diagnostic methods are urgently needed. Biosensors are a promising alternative to traditional methods such as ELISA, enabling point-of-care (PoC) analyses. These require biorecognition elements with high selectivity and stability to meet current requirements in PoC diagnostics [2]. This work aims to create an electrochemical biosensor that can detect CA 15-3 with high sensitivity and selectivity. The biosensor consists of molecularly imprinted polymer (MIP) as the biorecognition element, and it is assembled via electrochemical polymerization of a mixture of 3-acrylamidopropyl trimethylammonium chloride (AMPTMA) in the presence of CA 15-3. Electrochemical techniques such as cyclic voltammetry (CV), square wave voltammetry (SWV), and electrochemical impedance spectroscopy (EIS) were employed to evaluate the biosensor's electrochemical performance during its optimization and construction. CA 15-3 was successfully detected in a wide concentration range from 0.001 to 100 U mL<sup>-1</sup> in just 20 minutes, with an R<sup>2</sup> of 0.994. The MIP sensor showed minimal interference with other cancer proteins. This device offers rapid, sensitive, and cost-effective detection of CA 15-3, making it suitable for clinical PoC application.

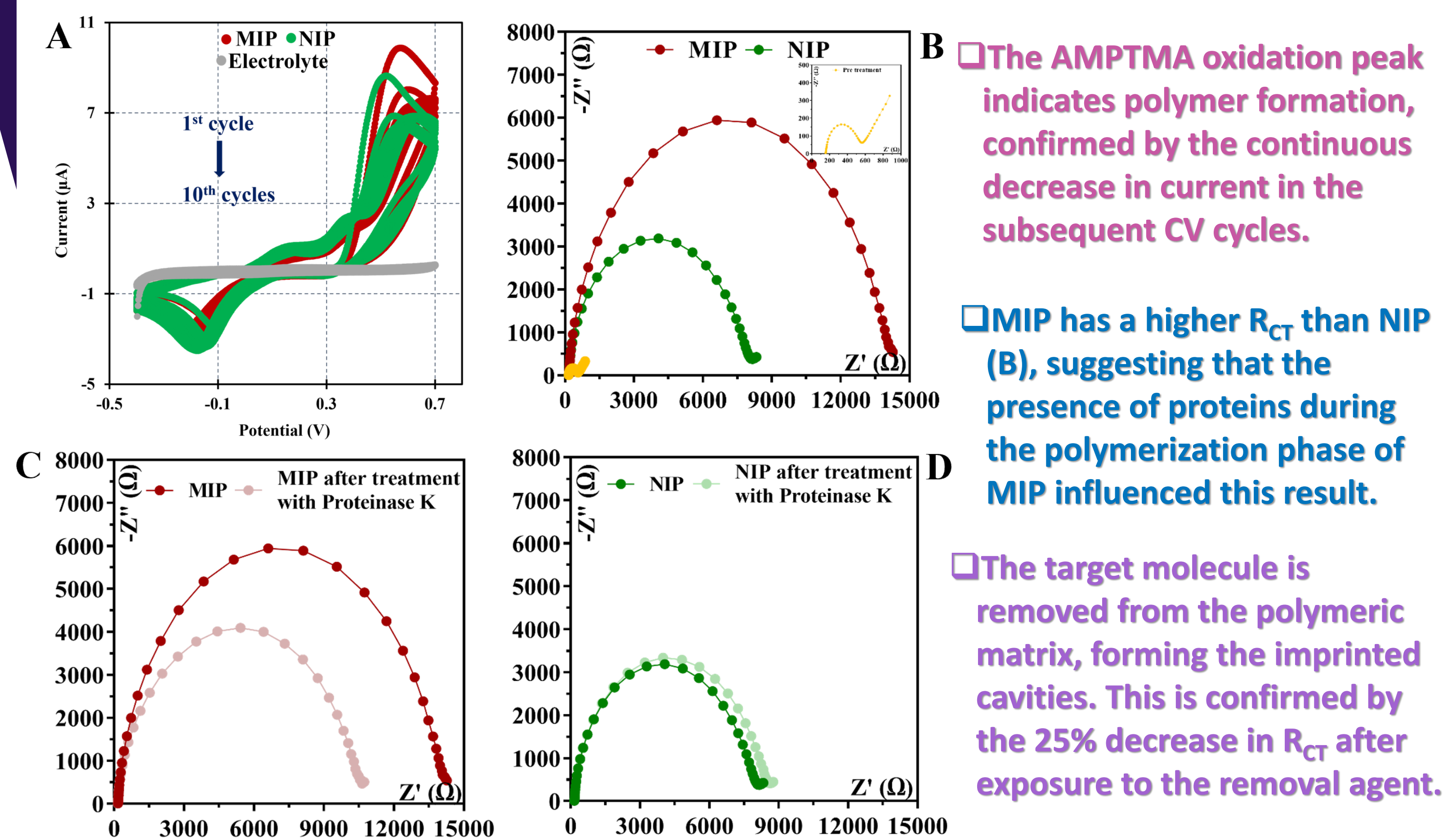
## METHODOLOGY



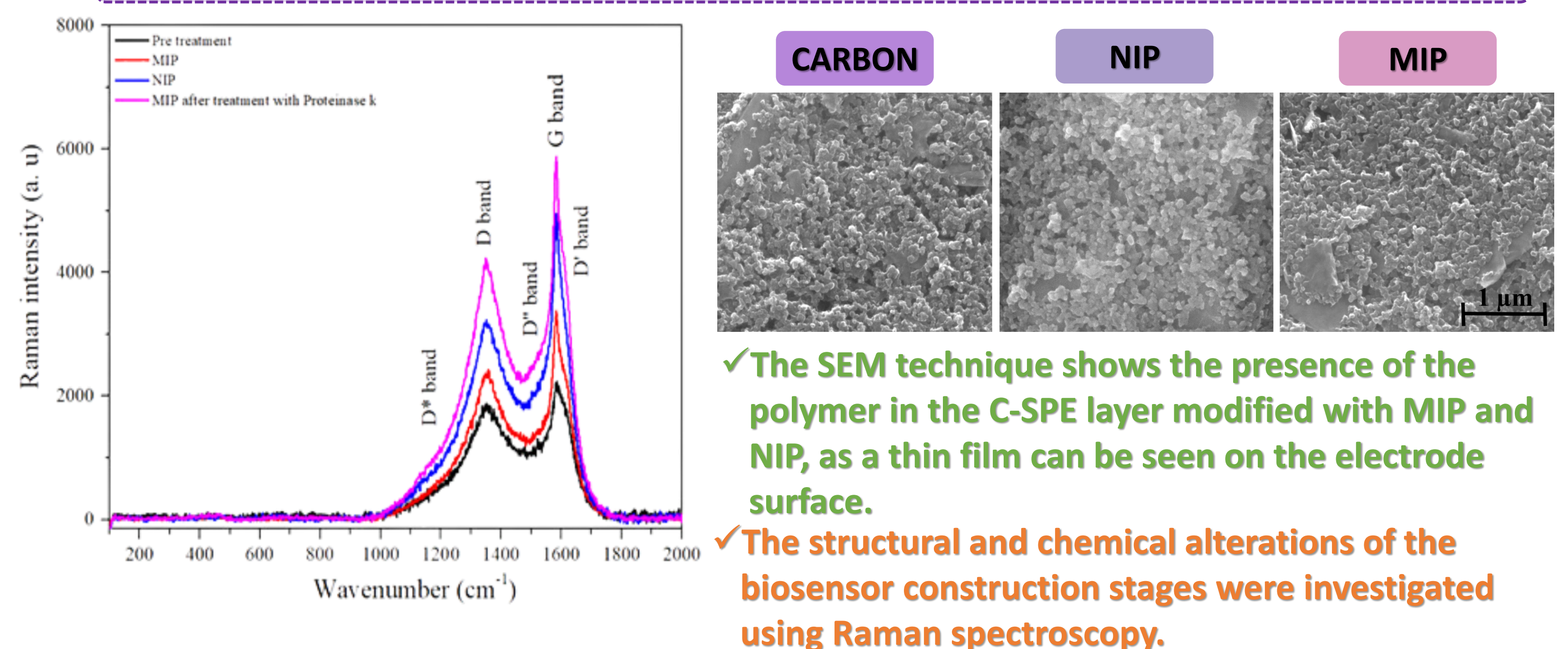
Schematic representation of a MIP for the detection of the CA 15-3 protein: **(A)** Work electrode pre-treatment; **(B)** electropolymerization of a solution containing CA 15-3 protein and monomer (AMPTMA); **(C)** CA 15-3 protein removal from polymer matrix; **(D)** template binding on the MIP surface; **(E)** Analytical performance of the sensor.

## RESULTS

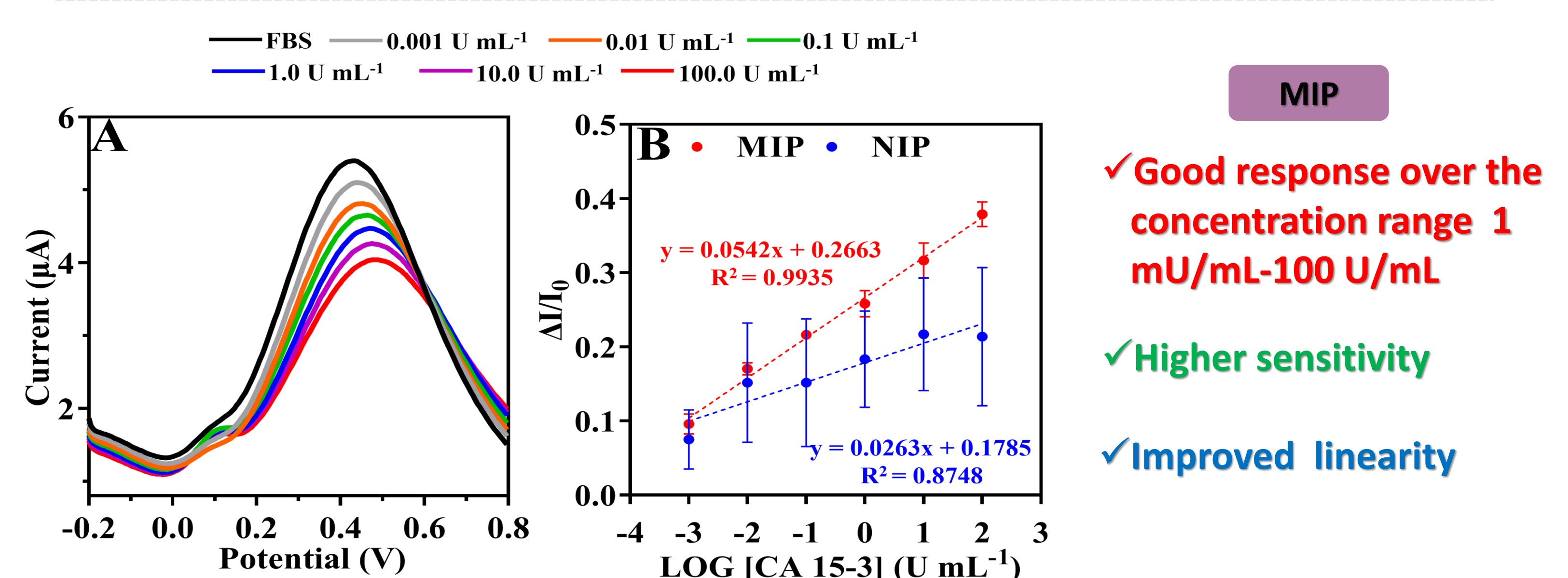
### Electrochemical assembly of the CA 15-3 biosensor



### Surface modification characterization



### Analytical performance of the biosensor



## GENERAL CONSIDERATIONS

- The biosensor developed showed good analytical performance.
- MIP showed superior sensitivity to NIP, suggesting specific sites for detection.
- Linear response range of the biosensor: 1 mU/ml to 100 U/ml.
- Effective tool for screening cancer biomarkers in PoC tests.

## ACKNOWLEDGMENTS

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## REFERENCES

- Griffin, S., 2017, S&T's Peer to Peer: Vol.1, Iss.2.
- Sarhadi, V. K., Armengol, G., 2022, Biomolecules, 12 (8), 1021.

Calibration of the CA 15-3 protein biosensor in the fetal bovine serum MIP (A) SWV plot; (B) Calibration curve for MIP and NIP at different concentrations prepared with FBS, using relative SWV data.