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# Voltammetric Platform for Real-Time Cretinine Monitoring in Clinical Applications

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## INTRODUCTION & AIM

**Creatinine: A Critical Biomarker**

Essential indicator for kidney function assessment and early detection of renal disorders

**Clinical Significance**

•Precise quantification essential for diagnosis and monitoring

•Critical for therapeutic intervention assessment

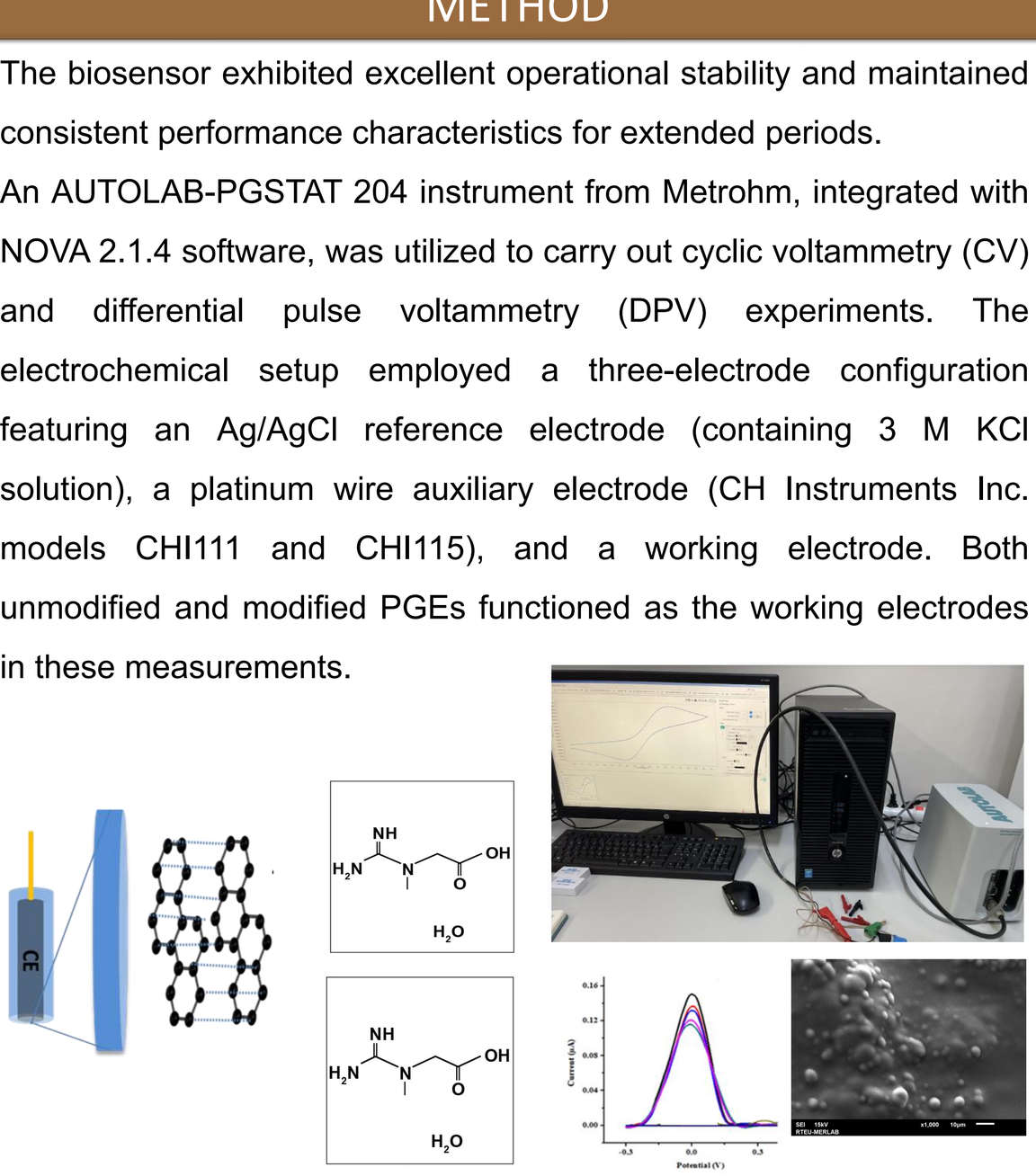
•Real-time monitoring enables better patient outcomes

A novel, highly sensitive and stable voltammetric biosensor was developed for accurate creatinine determination in clinical and pharmaceutical applications. Creatinine serves as a crucial biomarker for kidney function assessment, making its precise quantification essential for early detection of renal disorders and monitoring therapeutic interventions. The innovative electrochemical platform incorporates advanced nanomaterial modifications to enhance detection capabilities and analytical performance metrics. To develop a highly sensitive voltammetric biosensor for real-time creatinine monitoring with improved signal-to-noise ratios and rapid response times [1-3].

## METHOD

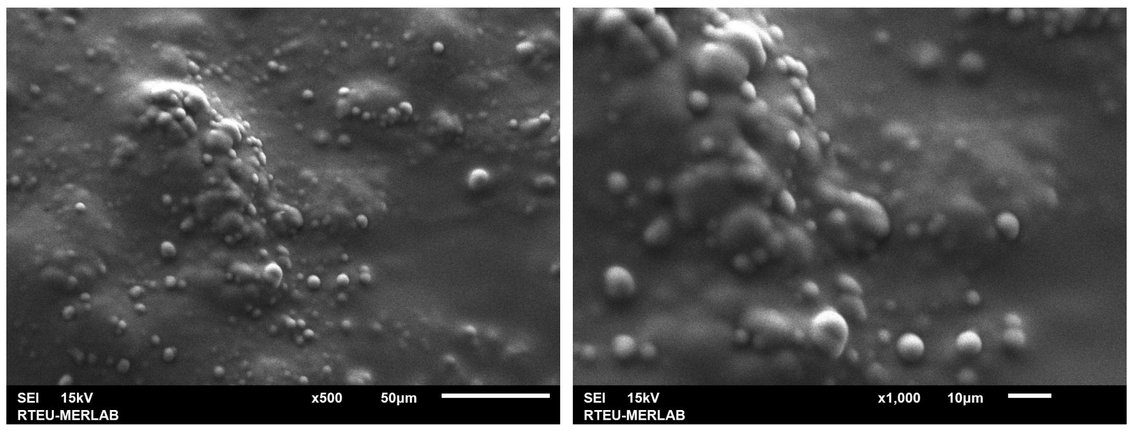
The biosensor exhibited excellent operational stability and maintained consistent performance characteristics for extended periods.

An AUTOLAB-PGSTAT 204 instrument from Metrohm, integrated with NOVA 2.1.4 software, was utilized to carry out cyclic voltammetry (CV) and differential pulse voltammetry (DPV) experiments. The electrochemical setup employed a three-electrode configuration featuring an Ag/AgCl reference electrode (containing 3 M KCl solution), a platinum wire auxiliary electrode (CH Instruments Inc. models CHI111 and CHI115), and a working electrode. Both unmodified and modified PGEs functioned as the working electrodes in these measurements.




Experimental Setup and Workflow

## RESULTS & DISCUSSION




SEM images of the section taken from the surface of the creatine electrode

**Operational Stability:**

- Maintained reproducible and stable electrochemical responses throughout at least 10 hours of constant operation with $1 \times 10^{-3}$ M creatinine solutions prepared in phosphate buffer medium
- Remarkable durability during prolonged testing periods

**Validation:**

- Successfully validated through comprehensive testing with pharmaceutical sample matrices
- Voltammetric performance characteristics including sensitivity, selectivity, detection limits, and linear response ranges were systematically investigated and optimized.

## CONCLUSION

This operational robustness indicates excellent potential for real-world clinical applications. The developed microsensors demonstrate superior performance for accurate creatinine determination, making them suitable for clinical diagnostics and pharmaceutical applications

## FUTURE WORK / REFERENCES

[1] Darmokoesoemo H., Khasanah M., Sari N. M., Kusuma H.S. 2017b. Analysis of creatinine by potentiometric using electrode carbon paste modified by molecularly imprinted polymer as sensor. Rasayan Journal of Chemistry, 10(2), 450-453.

[2] Delaney T.P., Mirsky V.M. and Wolfbeis O.S. 2002. Capacitive creatinine sensor based on a photografted molecularly imprinted polymer. Electroanalysis, 14(3): 221-224.