cbecimat26
26° Congresso Brasileiro de Engenharia e Ciência dos Materiais
22 a 26 de novembro de 2026
Costão do Santinho
Florianópolis-SC

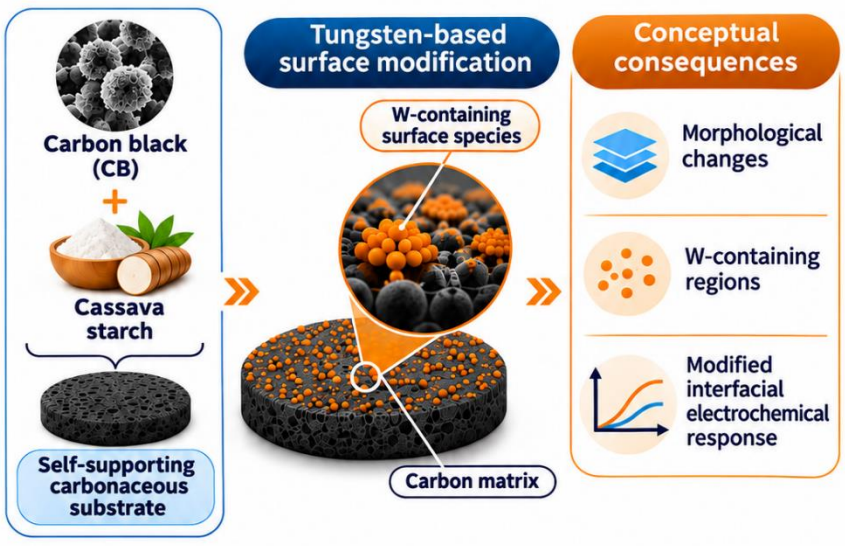
Magnetron Sputtering of WO_x on Carbon Black/Cassava Starch-Derived Carbonaceous Substrates for Electrochemical Applications

Helen Caroline de Souza Barros[1]; Mariane Satomi Weber Murase[1]; Marcilene Cristina Gomes[1]; Eduardo Petraconi Prado[1]; Gilberto Petraconi Filho[1]; David Alexandro Graves[1]; Argemiro Soares da Silva Sobrinho[1]; André Luis de Jesus Pereira[1]

1. Laboratório de Plasmas e Processos - LPP, Instituto Tecnológico de Aeronáutica - ITA, São José dos Campos (SP), Brasil.

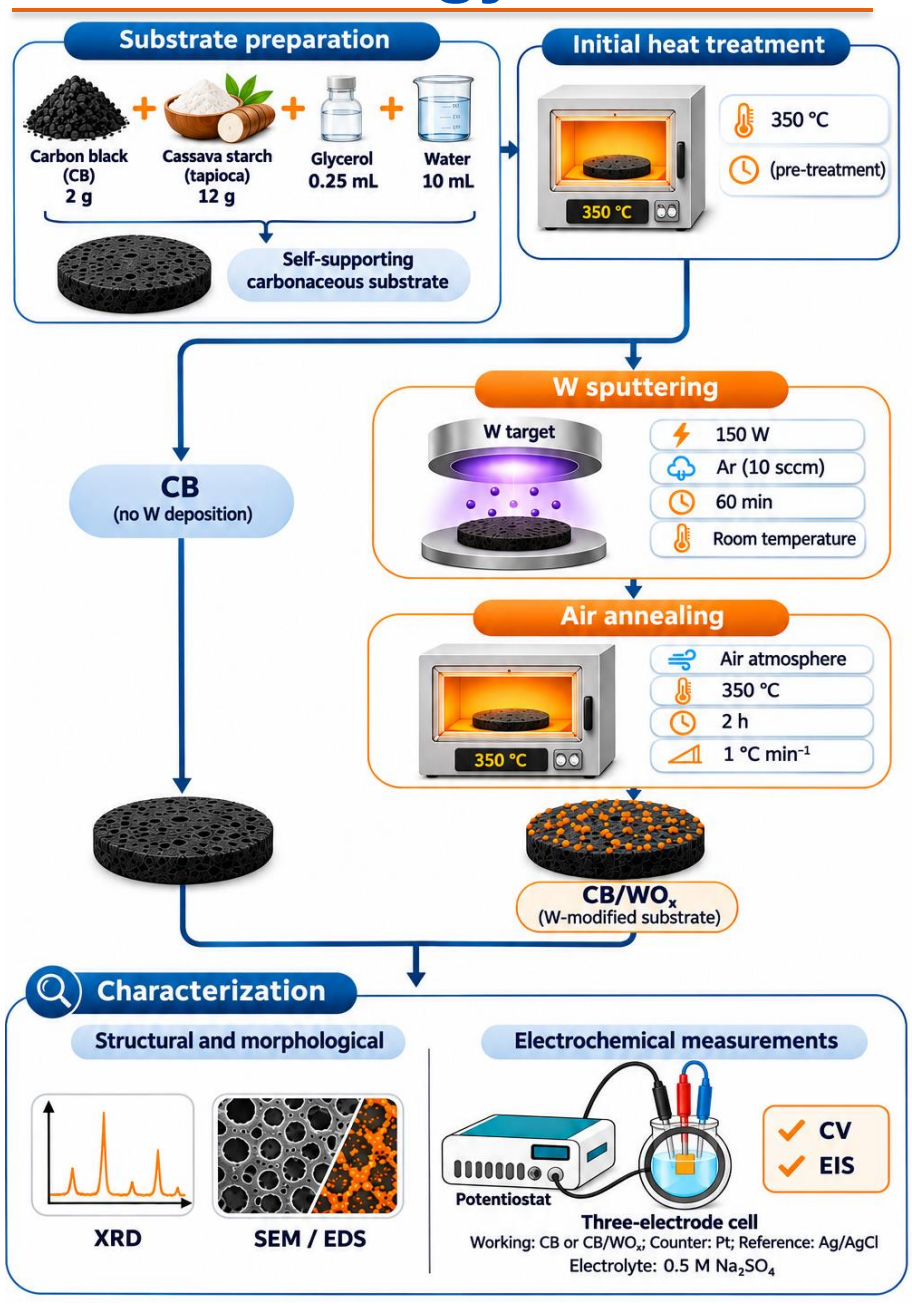
Introduction

Self-supporting carbonaceous electrodes are promising low-cost platforms for electrochemical applications. Tungsten-based surface modification can tailor their interfacial electrochemical response.



Objective: Investigate the structural, morphological, and electrochemical changes associated with tungsten-based surface modification of self-supporting carbon black electrodes.

Methodology



Results and Discussion

Surface morphology and composition

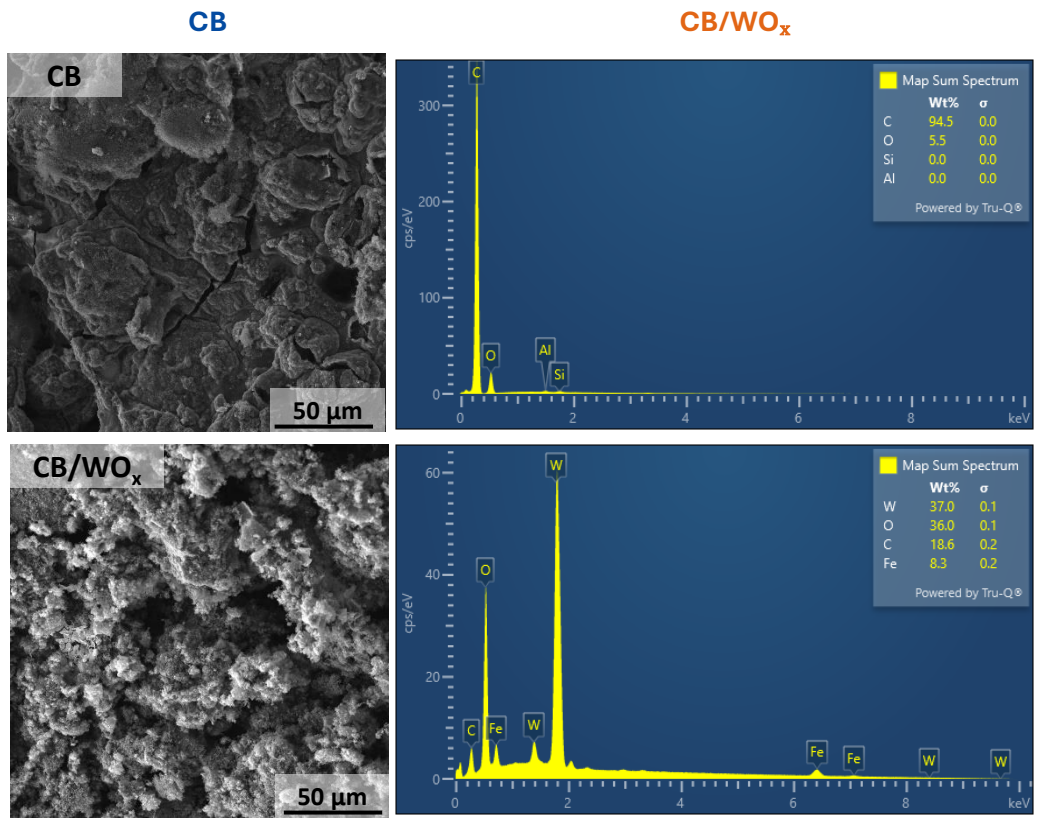


Fig. 1. SEM micrographs and EDS spectra of CB and CB/WO_x.

Structural and electrochemical response

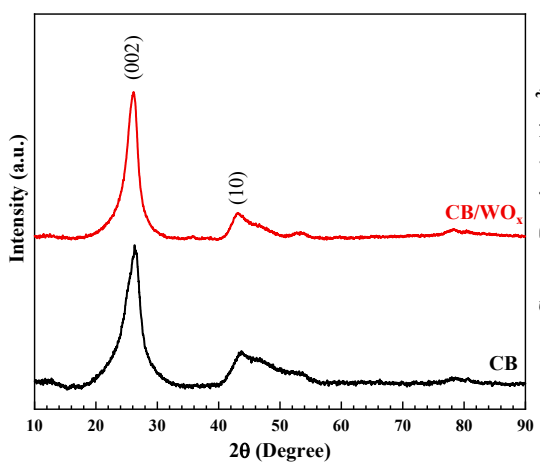


Fig. 2. XRD patterns.

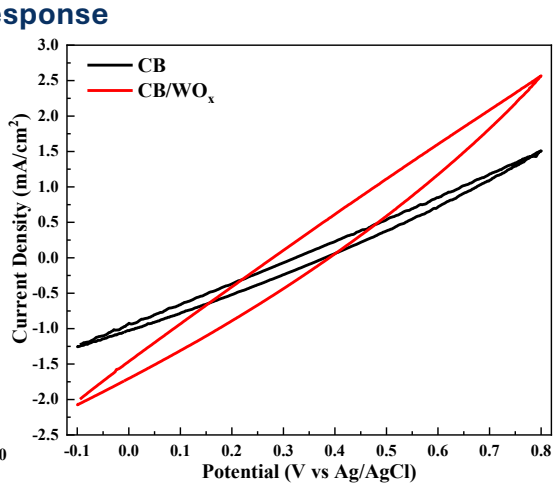


Fig. 3. Cyclic voltammograms.

Interfacial response — EIS

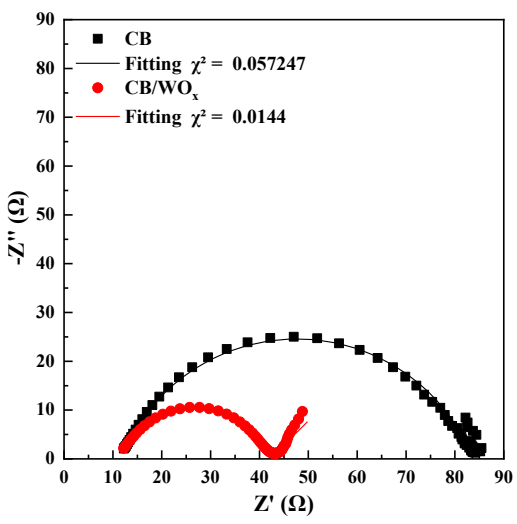
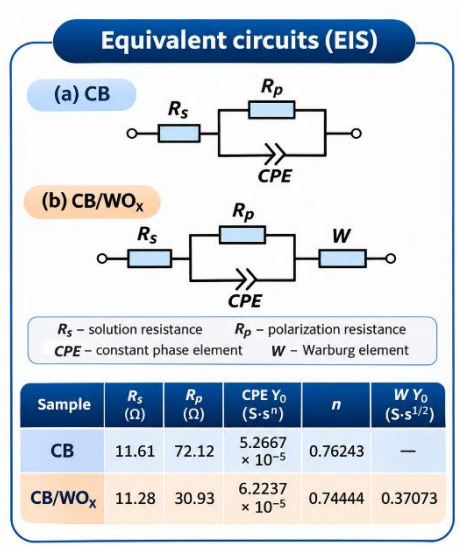


Fig. 4. Nyquist plots.



Sample	R_s (Ω)	R_p (Ω)	CPE Y_0 ($S \cdot s^n$)	n	W Y_0 ($S \cdot s^{1/2}$)
CB	11.61	72.12	5.2667×10^{-5}	0.76243	—
CB/WO_x	11.28	30.93	6.2237×10^{-5}	0.74444	0.37073

Conclusions

XRD
Carbon-related reflections predominate; no distinct crystalline WO_x phase.

SEM / EDS
Morphological changes and localized W-containing regions.

CV / EIS
Higher current densities; fitted Rp decreases from 72.1 to 30.9 Ω.

Next steps XPS chemical-state analysis • Deposition and thermal controls • Electrochemical stability

References & Acknowledgments

[1] Vicentini et al., Curr. Opin. Electrochem., 43, 101415 (2024). [2] Martey et al., Next Research, 2, 100192 (2025). [3] Ashok Reddy et al., Physica B, 664, 414996 (2023).

Acknowledgments: FAPESP (2026/10338-9; 2023/07607-0), ITA and LPP.

Special thanks to ENEVA for funding this R&D&I project.