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

Pt-Modified NiCo Sulfide/Nickel Felt Electrocatalyst for Ethanol Oxidation in Alkaline Media

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Introduction

Ethanol oxidation reaction (EOR) is a promising process for direct ethanol fuel cells (DEFCs), although its application is limited by slow reaction kinetics and catalyst deactivation. Nickel-based catalysts are attractive due to their low cost and Ni^{2+}/Ni^{3+} redox activity. Cobalt incorporation and sulfide formation can modify their electrocatalytic properties, while nickel felt substrate provides a conductive, self-supported structure. This study investigates Pt-modified NiCoS/NF catalysts for alkaline ethanol oxidation.

Objectives

This study aims to synthesize Pt-modified NiCoS supported on nickel felt substrate (Pt-NiCoS/NF) via electrodeposition tecnique, characterize its structural and morphological properties, and to evaluate its catalytic activity and stability toward EOR in alkaline media.

Methodology

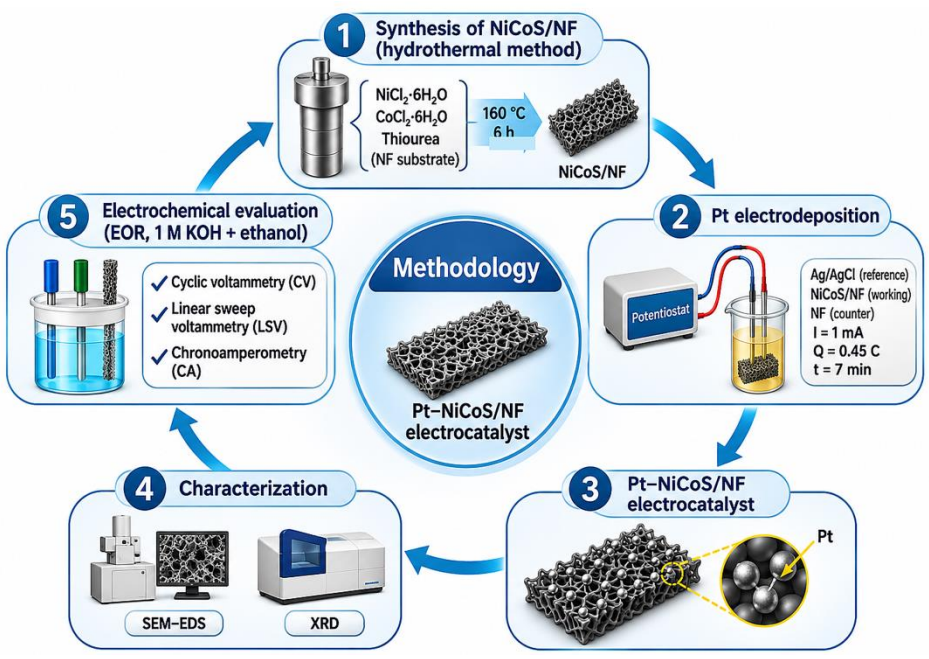


Figure 1. Schematic representation of the hydrothermal synthesis, Pt electrodeposition and electrochemical evaluation of Pt-NiCoS/NF.

Results and Discussion

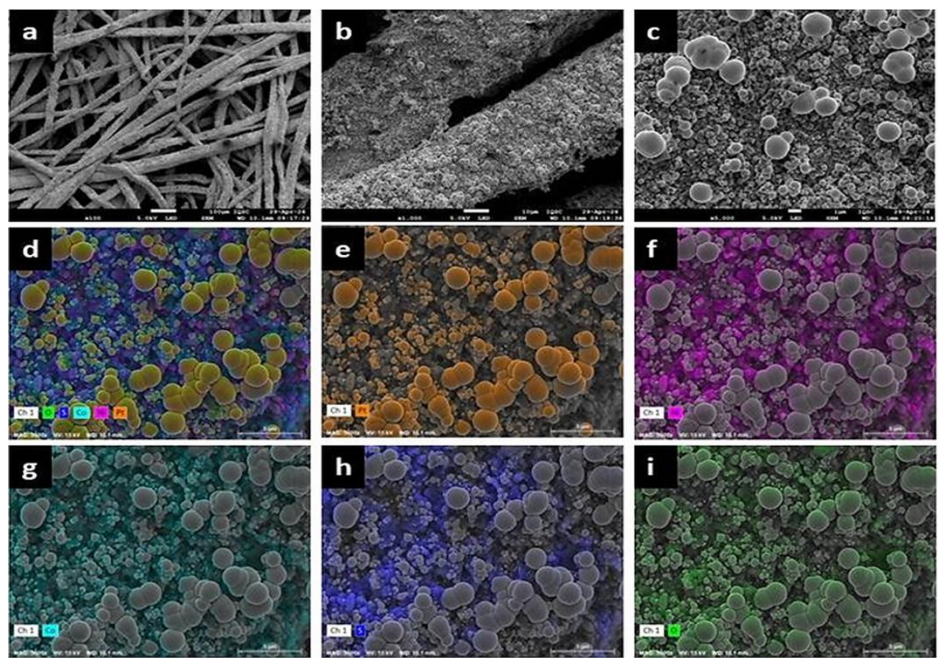


Figure 2. SEM images and EDS elemental mapping of Pt-NiCoS/NF electrode.

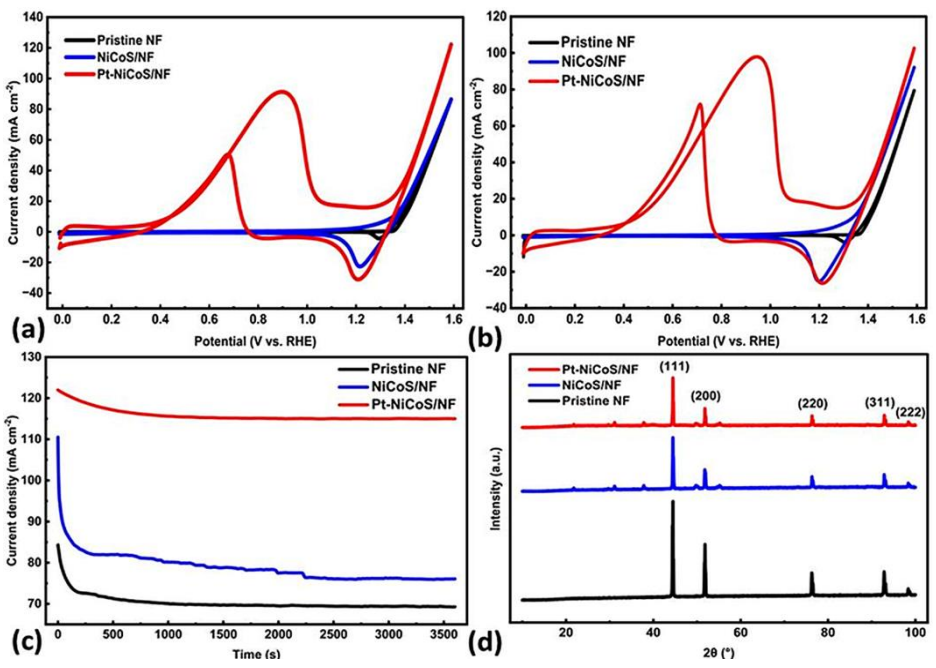


Figure 3. Electrochemical characterization of NF, NiCoS/NF, and Pt-NiCoS/NF: (a) CV before stability testing, (b) CV after stability testing, (c) chronoamperometry, and (d) XRD patterns.

Conclusion

SEM-EDS revealed the surface morphology and elemental composition of Pt-NiCoS/NF, while XRD showed the crystalline features of the electrode. The Pt-NiCoS/NF electrode exhibited a distinct EOR oxidation peak that remained evident after stability testing, demonstrating its potential for ethanol oxidation in alkaline media.

References

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YAQOOB, L. et al. A comprehensive and critical review of the recent progress in electrocatalysts for the ethanol oxidation reaction. RSC Advances, 11(27), 16768-16804 (2021).

Acknowledgments

FAPESP FUNDAÇÃO DE AMPARO À PESQUISA DO ESTADO DE SÃO PAULO
CNPq Conselho Nacional de Desenvolvimento Científico e Tecnológico
CAPES