PÔSTER - RESUMO - DISPOSITIVOS ELETRÔNICOS, ELETROQUÍMICOS, SUPERCAPACITORES E BATERIAS

ELECTROCHEMICAL SENSOR OF HEAVY METAL IONS IN WATER FROM THE CARBON BLACK AND G-C3N4 ELECTRODES.

Jessica Pêgo Gomes Damasceno (jessicadamasceno@alunos.utfpr.edu.br)

João B. Floriano (jbfloriano@utfpr.edu.br)

Paula Cristina Rodrigues (paulac@utfpr.edu.br)

Roberto Faria (faria@ifsc.usp.br)

The increasing contamination of river and lake waters and soil by heavy metals is a threat to human and animal health, and to certain natural biomes. Heavy metal cations, such as lead, cadmium and mercury, are released into the environment by industrial activities, mining, agriculture and improper waste disposal. Due to their high persistence, these metals do not readily degrade and tend to bioaccumulate within living organisms across trophic levels. The present study aims to build and characterize sensors capable of identifying metal ions of mercury, lead and/or cadmium in real water samples using modified carbon black (CB) electrodes, by mixing it with graphitic carbon (g-C3N4), a two-dimensional semiconductor material. The first step is the synthesis of the g-C3N4, from melamine by hydrothermal route. Then, g- C3N4 is deposited on CB electrodes, favoring the transfer of electrons from the metal cation to the sensor surface. It has already been proven that such a system allows good resolution in the detection of ionic substances. [1, 2] The anodic stripping voltammetry results showed well-defined and separated peaks for Cd2+, Pb2+,

and Hg2+, confirming the feasibility of simultaneous multi-metal detection. Although the bare glassy carbon electrode presented higher peak currents, g-C3N4 -modified electrode exhibited stable, well-resolved, and proportional responses toward Pb2+ concentration. The linear behavior observed demonstrates the reliability and analytical potential of the modified electrode, highlighting the contribution of g- C3N4 to improved signal definition and consistent quantitative performance. Impedance spectroscopy analysis showed that the real component of the complex impedance presents two plateaus: the one with the highest impedance, in the low-frequency regime, and the second with the lowest impedance, for higher frequencies. The Nyquist diagrams were analyzed by a Randles equivalent circuit, which showed a sensitive variation under doping by heavy metals. Therefore, the results show strong evidence that g-C3N4 is a two-dimensional system suitable for low-cost heavy metal sensors.

Acknowledgements

National Institute of Organic Electronics (INEO), FAPESP (2025/27044-5), CNPq (408449/2024-1), Araucaria Foundation and the NAPI Organic Electronics (092/2024).

References

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Palavras-chave: g-c3n4; metal ions sensor; eletroanalytical techniques.