PÔSTER - RESUMO - DISPOSITIVOS OPTOELETRÔNICOS

BIOINSPIRED COLORIMETRIC DOSIMETER FOR WATER DECONTAMINATION MONITORING

Bárbara Gosziniak Paiva (barbaragosziniak@gmail.com)

Andre Talvani (talvani@ufop.edu.br)

Maria Célia Da Silva Lanna (mcelanna@ufop.edu.br)

Rodrigo Fernando Bianchi (bianchi@ufop.edu.br)

Ensuring universal access to safe drinking water remains a global challenge. While effective, conventional disinfection methods, such as chlorination, may lead to undesirable taste, odor, or accessibility limitations. This study presents a flexible, printable colorimetric dosimeter to visually monitor the disinfection of water (Escherichia coli and total coliforms in 100 mL of water) using blue light (460 nm). The sensor is based on a thin light-sensitive Poly[2-methoxy-5-(2-ethylhexyloxy)-1,4-phenylenevinylene] (MEH-PPV) film printed on a paper substrate. Optical characterization revealed a progressive shift in photoemission and color (from orange to white) with increasing light exposure. Optimal disinfection of E.coli and total coliforms was achieved at a dose of 738 J/cm², corresponding to complete color bleaching in sensors with a single MEH-PPV layer under a radiance of 60 μW/cm² after 3.5 hours. The inspiration for the sensor's concept comes from the milk frog (Trachycephalus venulosus), which produces a white toxic secretion as a defense mechanism, signaling safety through its color. Analogously, the MEH-PPV-based sensor signals "safe" water when it turns white, indicating that the disinfection process has reached its

effective endpoint. These findings validate the potential of MEH-PPV-based paper sensors as simple, low-cost, and efficient tools for real-time monitoring of microbial inactivation in decentralized or low-resource settings.

References

1. KORNACKI, J.L. GURTLER, J.B. & STAWICK, B.A. En-terobacteriaceae, coliforms, and Escherichia coli as quality and safety indicators. In: SALFINGER, Y. & TORTORELLO, M.L. (eds.), Compendium of Me-thods for the Microbiological Examination of Foods, 5th ed. American Public Health Association, Washing-ton, D. C., 2015. Chapter 9, p103-120.

2. TALLON, P., MAGAJNA, B., LOFRANCO, C., LEUNG, K.T. Microbial indicators of faecal contamination in water: a current perspective. Water Air Soil Pollut. 166 p, 2005.

3. BRASIL. PORTARIA GM/MS Nº 888, DE 4 DE MAIO DE 2021. Altera o Anexo XX da Portaria de Consolidação GM/MS nº 5, de 28 de setembro de 2017, para dispor sobre os procedimentos de controle e de vigilância da qualidade da água para consumo humano e seu padrão de potabilidade. Diário Oficial da União (DOU) no dia 7 de maio de 2021. Brasília, DF, 90, Edição 96, 69 p, 2021. Seção 1.

4. Goeldi EA. Biology and Captive Breeding of the Amazonian Milk Frog, Trachycephalus resinifictrix. Reptiles & Amphibians. 1907. Available from: https://journals.ku.edu/reptilesandamphibians/article/view/14047/12957

Acknowledgments

The authors would like to acknowledge the support of the Brazilian research agencies CAPES (Coordination for the Improvement of Higher Education Personnel), CNPq (National Council for Scientific and Technological Development), FAPEMIG (Research Support Foundation of the State of Minas Gerais) for funding and infrastructure, INEO (FAPESP - process: 2025/27044-5 e CNPq - process: 408449/2024-1). We also thank the Federal University of Ouro Preto for providing access to laboratory facilities.

Palavras-chave: fecal coliforms; microbiological safety; water treatment; printable device; blue light; colorimetric dosimeter.