PÔSTER - RESUMO - SENSORES E BIOSSENSORES

MULTICOLOR PAPER-BASED MEH-PPV SENSOR FOR FAR-UVC (222 NM) RADIATION MONITORING

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In recent years, radiation-based technologies have played a central role in medical diagnostics, cancer therapy, and environmental sterilization processes. In particular, germicidal ultraviolet (UV) radiation has become a key tool for pathogen inactivation in hospital and critical environments. Among the UV spectral ranges (200–400 nm), far-UVC radiation at 222 nm has emerged as a promising alternative due to its high efficiency in inactivating viruses and bacteria while exhibiting limited penetration into the deeper layers of human skin. Although considered safer than conventional 254 nm UVC sources, prolonged or uncontrolled exposure to 222 nm radiation may still cause ocular and superficial tissue damage, underscoring the need for accurate and reliable radiation monitoring systems that can prevent overexposure while maintaining disinfection efficacy. In this context, this work proposes the development of an innovative multicolor optical sensor based on the conjugated poly[2-methoxy-5-(2-ethylhexyloxy)-1,4-phenylenevinylene] (MEH-PPV) combined with colorimetric pigments and deposited onto a flexible paper substrate (MEH-PPV/Paper/PS + pigment). MEH-PPV was selected due to its strong photoluminescent response, high sensitivity to photoinduced processes, and ability to undergo optical and electronic property modifications upon UV exposure. The paper substrate provides a low-cost, lightweight, flexible, and

biocompatible platform with intrinsic UV absorption properties and visible emission centered around 450 nm (blue region), enabling optical coupling with the MEH-PPV layer and the formation of a controllable emission window. The integration of calibrated colorimetric pigments allows the fabrication of a six-color responsive film, in which distinct color transitions correlate with increasing far-UVC dose or intensity. This multicolor approach enables direct visual detection of radiation levels without the need for complex electronic readout systems, while also allowing spectroscopic quantification through wavelength-dependent emission shifts. The proposed sensing mechanism is based on far-UV-induced photophysical and photochemical modifications in the conjugated polymer, leading to variations in emission spectra and chromatic response. By correlating color transitions with irradiation time and intensity, the device provides real-time qualitative and quantitative information about far-UVC exposure. The combination of organic semiconductor materials with a paper-based platform results in a sustainable, scalable, and mechanically flexible sensor architecture suitable for integration into medical environments, sterilization chambers, and personal protective monitoring systems. This study contributes to the advancement of organic optoelectronic sensors for radiation monitoring, providing a safe, accessible, and cost-effective approach to enhance environmental control and human protection in germicidal UVC applications.

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Palavras-chave: uvc radiation; meh-ppv; paper-based sensor; organic optoelectronics.