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

INKJET-PRINTED RGO AND SILVER ELECTRODES ON BIODEGRADABLE SUBSTRATES FOR SUSTAINABLE ORGANIC ELECTRONICS

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The increasing demand for flexible, lightweight, and environmentally responsible electronic devices has intensified research into sustainable materials compatible with additive manufacturing technologies. In this context, this work reports the fabrication of conductive electrodes based on reduced graphene oxide through inkjet printing on biodegradable substrates, aiming at low-cost and eco-friendly solutions for organic electronics. The integration of carbon nanomaterials with biodegradable polymers represents a relevant strategy for reducing the environmental impact associated with conventional electronic waste, while preserving functional electrical performance, mechanical robustness, and structural integrity required for reliable device operation in flexible electronic systems. A reduced graphene oxide ink was formulated using terpineol as a green solvent to ensure adequate viscosity, surface tension, and dispersion stability for drop-on-demand deposition. The electrodes were printed using a Dimatix DMP-2850 system onto transparent and flexible substrates composed of polylactic acid and nanocellulose, allowing precise control of

pattern geometry, lateral resolution, and film thickness. For comparative purposes, a commercial silver nanoparticle ink was also evaluated as a metallic reference material, enabling direct assessment of conductivity, sheet resistance, and pattern definition between carbon-based and metallic electrodes. Printing parameters, including drop spacing and substrate temperature, were optimized to obtain homogeneous films and reproducible electrode architectures compatible with scalable device fabrication.

Morphological characterization was performed by atomic force microscopy to analyze surface roughness, thickness uniformity, and microstructural organization of the printed films. Electrical properties were determined using the four-point probe method before and after reduction treatments, which promoted partial restoration of the conjugated sp^2 carbon network and enhanced charge transport pathways. The results demonstrate that inkjet-printed rGO electrodes on biodegradable substrates exhibit stable electrical behavior under mechanical deformation and repeated bending cycles. Although silver-based electrodes present higher intrinsic conductivity, graphene-based electrodes offer advantages in environmental compatibility, mechanical flexibility, and material versatility, supporting the development of sustainable printed organic electronic platforms.

Palavras-chave: rgo; dimatix; silver electrodes; pla.