PÔSTER - RESUMO - INOVAÇÃO

EMAT: FROM ACADEMIC RESEARCH TO TECHNOLOGICAL INNOVATION IN CONDUCTIVE INKS IN BRAZIL

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The absence of domestic production of conductive polymer inks represents a technological bottleneck for the advancement of organic and printed electronics in Brazil. PEDOT:PSS is a benchmark mixed ionic-electronic conductor widely employed in thermoelectric devices, organic photovoltaics, electrochemical capacitors, and bioelectronic interfaces. However, its synthesis know-how and formulation control remain concentrated in a small number of international suppliers, limiting technological autonomy and material customization for local research and industry.

EMAT emerged from academic research on polymerization of PEDOT:PSS, where systematic control of reaction parameters demonstrated direct impact on final ink properties and the performance of the devices. This knowledge was translated into proprietary formulations validated in energy devices and reported in Materials Advances (2025), [1] establishing a scientific and technological foundation for the company's activities.

From this platform, three ink lines were developed: Fluxel, optimized for thermoelectric response; Polaraci, designed as hole-transport layer for organic solar cells; and Tupane, tailored for electrochemical energy storage. These

materials demonstrated competitive performance compared to commercial benchmarks, confirming that synthesis-level engineering enables modulation of electrical conductivity, Seebeck coefficient, interfacial selectivity, and ionic transport.

The ongoing FAPESP PIPE Phase 1 project (process nº 2024/18520-5) focuses on refining synthesis reproducibility and expanding structure–property correlations. Rather than scale-up, the current effort concentrates on kinetic control of oxidative polymerization, batch consistency, and systematic adjustment of oxidation state and microstructure to further enhance thermoelectric efficiency, photovoltaic interfacial energetics, and electrochemical stability.

Within the INEO network, EMAT seeks collaborative validation of its materials across diverse device architectures and characterization platforms. By integrating polymer chemistry, device physics, and electrochemical analysis, the initiative strengthens academia-industry interaction and consolidates a national platform for conductive polymer ink development.

References

[1] Synthesis engineering and development of emergent conducting pi-conjugated materials: applications in energy harvesting and storage devices. Materials Advances, 2025, 6, 6066–6075.

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