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Integration of Eumelanin into PEDOT:PSS: from blending to doping and beyond ?

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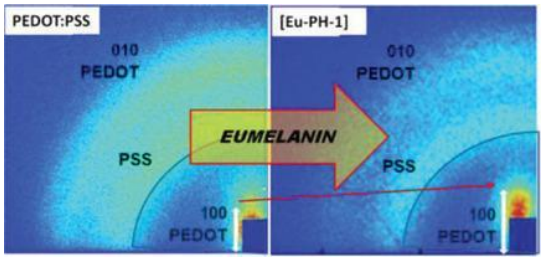
The chemically polymerized 3,4-ethylenedioxythiophene (PEDOT), kept solvated by polystyrenesulfonate (PSS), plays a chief role as coating agent for quite passive devices such as recording or stimulating electrodes, but also as main component of the channel in organic thin film transistors.
The use as coating agent for electrodes often requires the introduction of a cross-linker, such as GOPS (3-glycidoxypropyltrimethoxysilane), to prevent delamination of PEDOT:PSS films from substrates and improve their long-term stability into the aqueous environment of biological media or living tissues.[1]
Indeed limits such as the relatively low adhesion particularly on inorganic substrates and low stability to water do hamper PEDOT:PSS exploitation (eg. as material transduction signals across the biotic/abiotic interfaces) and several strategies have been developed to address these limits.[2] [3]
Among bioinspired materials for functional biocompatible interfaces, the human pigment eumelanin is currently gaining increasing interest. This black insoluble pigment of human skin, hair, eyes and nigral neurons (neuromelanin), arises biogenetically from the aminoacid tyrosine via the oxidative polymerization of 5,6-dihydroxyindole (DHI) and/or 5,6-dihydroxyindole-2-carboxylic acid (DHICA).[4]
Here, we present an overview of eumelanin-PEDOT blends (EuPH, C-EuPH), featuring valuable functional and processing properties, like easy films preparation, high adhesion, good electrical conductivity and biocompatibility.



The hybrids were characterized by chemical, physical, electrical and morphological analysis. The biocompatibility and toxicity was investigated in view of their potential exploitation as bio-interface material.
Finally, as a proof of concept, ITO-free organic light emitting devices, featuring EuPH as the anode, and presenting performances comparable to reference ITO-free devices, were fabricated and characterized.

4. References

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