PÔSTER - RESUMO - DISPOSITIVOS OPTOELETRÔNICOS

ELECTROCHEMICAL SYNTHESIS OF PANI WITH DIFFERENT DOPANTS FOR APPLICATION AS A HOLE TRANSPORT LAYER IN PEROVSKITE PHOTOVOLTAIC DEVICES

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Polyaniline (PAni) is a p-type semiconducting polymer that can be utilized as a hole transport layer (HTL) in photovoltaic devices [1]. Electrochemical synthesis of PAni allows for direct deposition onto the electrode, forming a uniform thin film. By using different dopants, the conductive and morphological properties of the film can be tailored [2]. In this work, photovoltaic devices were developed following the architecture ITO/PAni/PEAI:MAPI:salophen/PCBM/BCP/Ag, employing various electrochemical synthesis routes for PAni. The PAni film was synthesized via cyclic voltammetry on ITO with a potential scan from -0.1 V to 0.9 V. A three-electrode system was used with a solution of 0.1 M aniline and 0.5 M dopant in distilled water. First, PAni samples doped with different acids (HCl, H2SO4, and H3PO4) were prepared to determine the optimal dopant. Variations in scan cycles (1, 2, 3, and 5 cycles) were also performed. The active layer and electron transport layers were deposited by spin-coating. For the active layer, a PEAI (phenethylammonium iodide) film was deposited, followed

by a MAPI (methylammonium lead iodide) film with the addition of salophen in the anti-solvent solution. For the electron transport layers, a PCBM ([6,6]-phenyl-C61-butyric acid methyl ester) film was deposited from a 20 mg/ml solution in chlorobenzene, and a BCP (bathocuproine) film from a 0.5 mg/ml solution in isopropanol. To complete the device, a silver metallic film was evaporated. The results showed that devices using H3PO4 as a dopant achieved the best efficiency. The highest Power Conversion Efficiency (PCE) and Fill Factor (FF) values were observed in samples with PAni synthesized between 1 and 3 cycles. The 1-cycle sample reached a PCE of 11.5% and an FF of 67%, while the 3-cycle sample reached a PCE of 10.1% and an FF of 64.8%. Finally, this study identified the optimal conditions for the electrochemical synthesis of PAni for HTL applications; subsequent electrical and morphological measurements of the PAni thin film will be conducted for further analysis and synthesis refinement.

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Palavras-chave: polyaniline; perovskite solar cells; electrochemical synthesis.