

## Supervisor Diploma Thesis Evaluation

Diploma Thesis:	Organic Photovoltaic Cells with HTL Layer Based on Conductive Polymers
Author of Diploma Thesis:	BSc. Bright Ampohsah
Supervisor:	Doc. Ing. Tomáš Syrový, Ph.D.

Student Ampohsah's diploma thesis deals with problematic in the field of printed electronics, specifically in the field of OPVs and especially in the direction of characterizing their properties. The goal of the diploma thesis was to conduct research on the topic of organic photovoltaic solar cells, currently used materials and, based on the scientific articles and knowledge of their preparation procedures, develop a methodology for evaluating cells and their individual layers. The aim of the thesis was to focus on microscopic and spectroscopic techniques, ellipsometry and other non-destructive instrumental characterisation techniques.

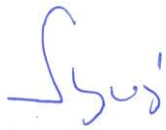
The experimental part of the work was primarily focused on the characterization of solar cells prepared in collaboration with academic partner, where stack glass/ITO/ZnO/PTB7-Th:IEICO-4F/Fluorinated PEDOT:PSS/PEDOT:PSS was used, with varying thicknesses PTB7-Th:IEICO-4F and PEDOT:PSS, which was prepared at UPCE. Individual layers were also created for the materials used, which were evaluated separately using various spectroscopic techniques (UV/VIS, FTIR). At the same time, the parameters for the ellipsometric evaluation of the layers and the OPV stack were also measured or obtained in the literature. Based on a series of measurements, an analysis of individual OPV variations was carried out, and the thicknesses of individual layers were estimated using ellipsometry. From the data obtained, very good estimates can be seen, especially for layers based on PEDOT:PSS, and thus it can be concluded that such complex sandwich structures can be non-destructively analyzed using ellipsometry. Which is a very valuable result. Results from ellipsometric measurement or the influence of the thicknesses of the modified layers were also discussed in relation to the results obtained for the performance characteristics of the cell itself, where the highest conversion was shown by samples 2 and 8, which had a medium thickness of the HBJ layer and, in general, the highest thickness of the PEDOT:PSS layer. In addition to ellipsomet-

ric measurements, AFM analysis, SEM microscopy, FTIR and EDX were also performed for selected types of layers. The student drew adequate conclusions from the measured data.

From the point of view of formal evaluation, it can be stated that the submitted work is written in good technical language and has a good typographic level.

The final thesis of Bright Ampohsah fulfills the assignment, I recommend it for defense and propose to classify it with grade B.

In Pardubice 22. 5. 2024



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Doc. Ing. Tomáš Syrový, Ph.D.