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The new materials for organic electronics and photovoltaics

MOTIVATION

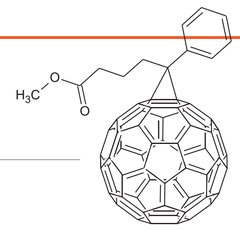
Introduction

The field of organic electronics has progresses enormously in recent years as a result of worldwide activity in numerous research groups. The advances in organic electronics have generated a vital and growing interest in organic materials research, and could potentially revolutionize future electronic applications. One of interesting materials can be humic substances (HSs) and phtalocyanines. HSs are organic light-absorbing macromolecules found in nature. It is well-known that they exhibit important properties from the photochemical point of view. Phthalocyanines have excellent stability, a rich redox chemistry, p-type and also n-type semiconducting properties, high LUMO energy level, and relative high hole mobility .

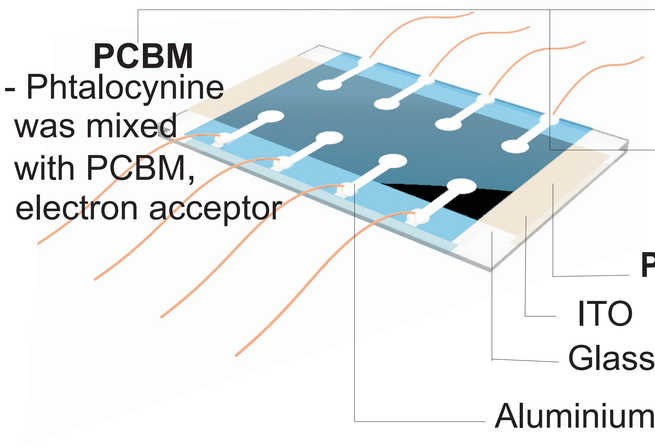
EXPERIMENT

Experiment

Materials and Samples



PCBM
- Phtalocynine was mixed with PCBM, electron acceptor



Phtalocyanine - monomolecular electron donor, prepared by spin-coating

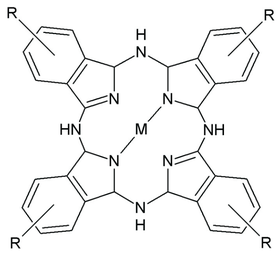
PEDOT:PSS - transport layer, (poly(3,4-ethylenedioxythıophene): poly(styrene sulfonate)), prepared by spin-coating

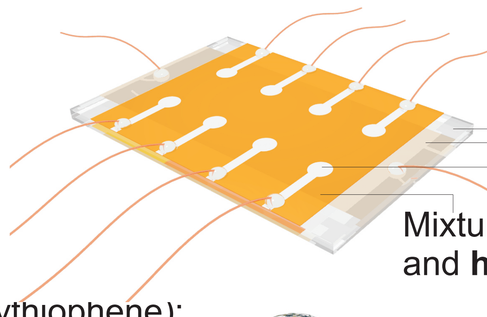
ITO

Glass

Aluminium electrode

Architecture of phtalocyanine samples



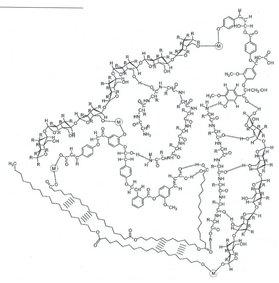


Glass **ITO**

Aluminium electrode

Mixture of **phtalocyanines** and **humic substances**

Architecture of samples with different ratio of phtalocyanines and humic substances



RESULTS, DISCUSSION

Results and Discussion

The prepared thin layers were studied with respect to their potential application in electronics and photonics, therefore their electrical pproperties were studied in detail. Optical characterization of materials was provided by absorption spectroscopy in UV-VIS area, fluorescence spectrometry and lifetime fluorescence spectroscopy. Electrical properties such as conductivity and photoconductivity were chracterized by current-voltage measurement.

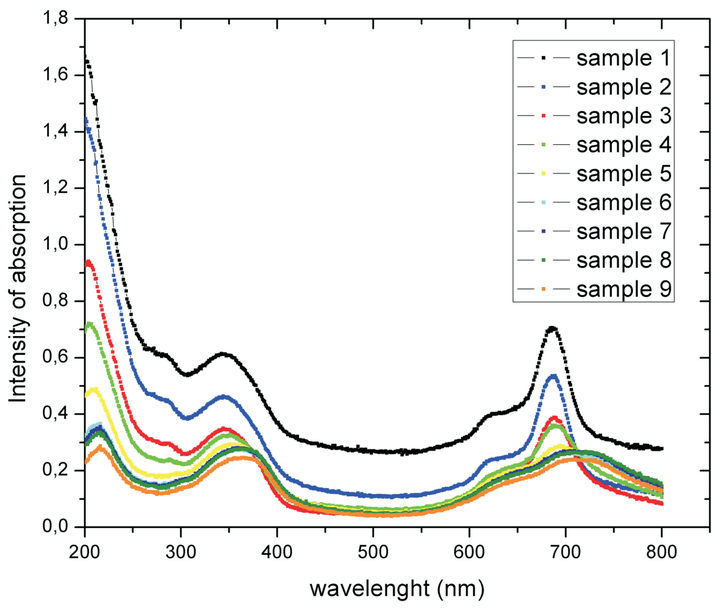


Figure 1: Absorption spectrum of mix Humic substances and phtalocynines

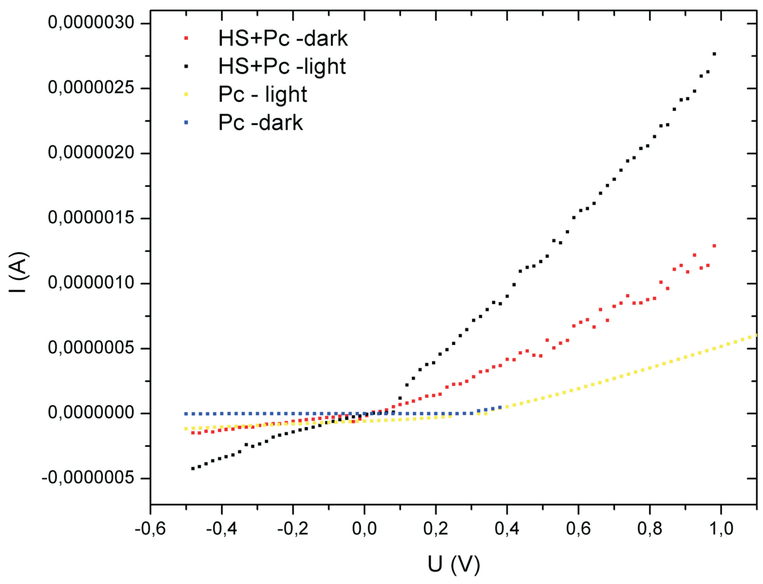


Figure 2: I-V characteristics of mix Humic substances with phtalocyanines and phtalocyanines.

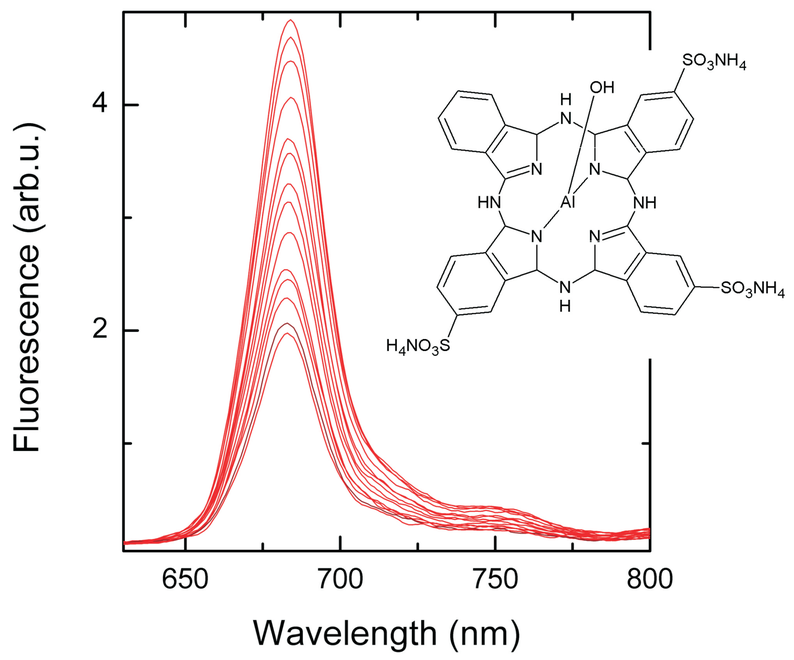


Figure 3: The fluorecsence decrease with increasing concentration of quencher

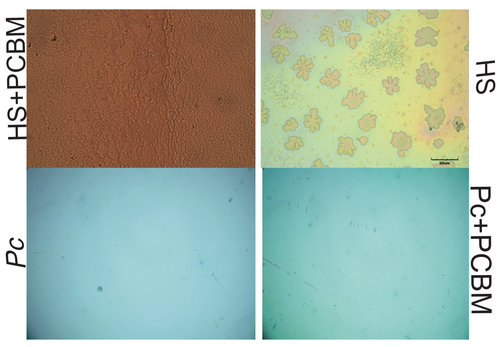


Figure 4: Microphotography of function layers

Absorption spectra of mix humic substances and phtalocyanines can be seen in Figure 1. Conductivity measurements in dark and light of mix humic substances+phtalocyanines and phtalocyanines is shown in Figure 2.Solutions with adequate concentration of phtalocyanines were prepared and their absorption like emission spectra were studied with an increase of concentration of quencher (PCBM fulleren), this dependence of fluorescence of phtalocyanines on concentration of quencher is depicted in Figure 3. Microphotography in Figure 4 shows that morphology of prepared function layers is quite different. All prepared function layers have approximatly the same thickness about 100 nm.

CONCLUSIONS

Conclusion

Conductivity and optical properties of HSs and phtalocyanines were measured to provide an undersanding of the behavior of these materials as a semiconducting materials usable for non-metallic electronic. The HSs layers thickness have been investigated using confocal laser scanning microscopy. Thin layers of humic substances were doped with phtalocyanine and fullerenes as modifiers of optical and electrical properties of humic substances. The results partially support the investigated idea about semiconductive characteristic of humic substances and it is task for more measurements confirm and extend conclusions. Reported results can be considered only as a hint to push forward further effort to use the humic substances as a semiconductive materials useful for non-metallic electronic.

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