Stable Next-Generation Photovoltaics: Unravelling Degradation Mechanisms of Organic Solar Cells by Complementary Characterization Techniques
StableNextSol – MP1307

Fabrication and Characterization of organic solar cells with several types of phthalocyanines

MP1307

YUNUS YAVUZ

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GEBZE TECHNICAL UNIVERSITY

EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

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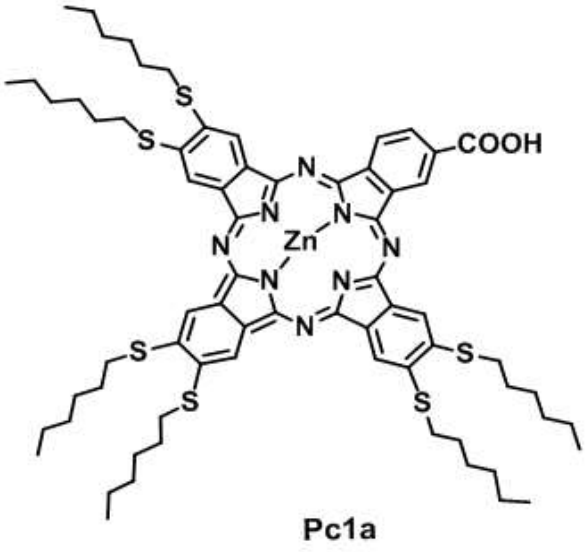
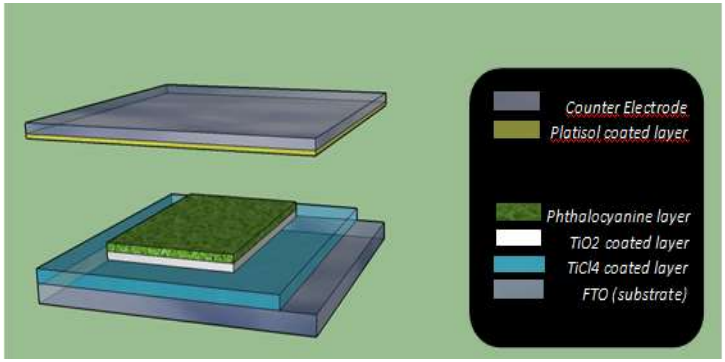
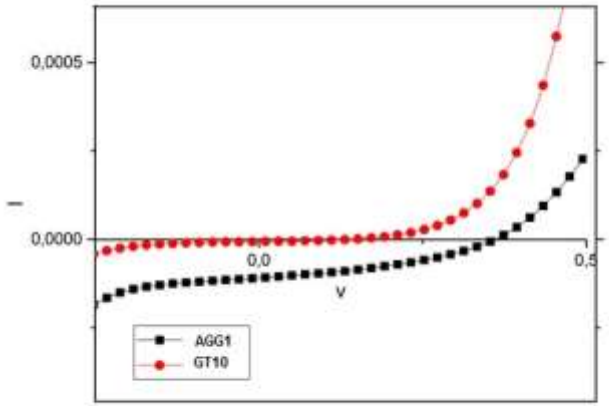
HOST Laboratory /Country and PI: Hybrid Solar Energy Conversion Department of Physics and Astronomy VU Amsterdam The Netherlands
GUEST Laboratory/ Country and PI: Gebze Technical University TURKEY
ESR Name:
Duration: 21 Days

Objectives

In this work, 5 different types of phthalocyanines have been designed and synthesized. We investigated the influence of the thickness of TiO2 layer, dipping time in dye solutions to control the thickness of phthalocyanine coated layer and two different electrolyte solutions on the dye-sensitized solar cell (DSSC) performance.







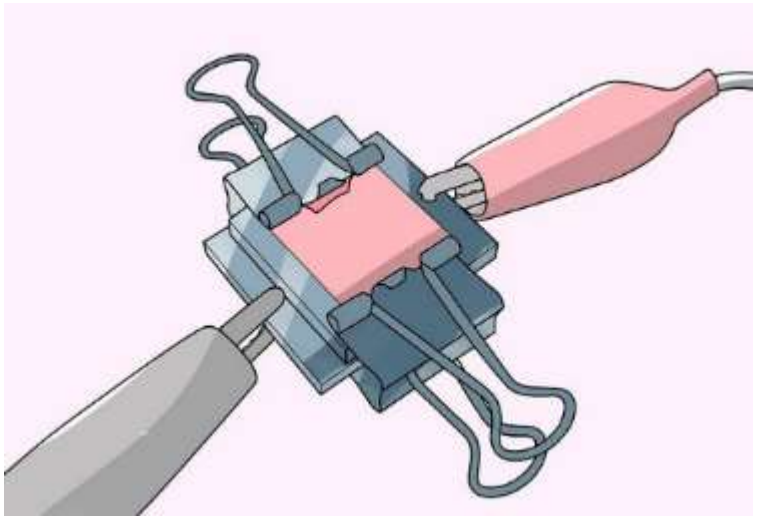
AGG-1
Chemical Formula: $C_{69}H_{88}N_8O_2S_6Zn$
Molecular Weight : 1316,49 g/mol
Solvent: Chloroform

- **RESULTS**

Dye	Dipping time	Electrolyte	Efficiency	Fill Factor	I_{sc}	V_{oc}	TiO2 coating speed(rpm)
AGG1	24	AY2	0.141790	39,44828	0.100702	0.356926	2000
AGG1	24	Z150	0.033610	72,93259	0.003508	1..31376	3000
AGG1	**48**	**AY2**	**0.169655**	**45,79487**	**0.083467**	**0.443848**	**3000**
AGG1	48	Z150	0.082386	51,09740	0.039391	0.409316	2000
GT4	24	AY2	0.014857	29,18716	0.035414	0.143735	2000
GT4	24	Z150	0.027424	36,65964	0.031418	0.238100	3000
GT4	48	AY2	0.024963	30,90433	0.043729	0.184719	2000
GT4	48	Z150	0.070206	44,86836	0.047013	0.332826	3000
GT10	24	AY2					3000
GT10	24	Z150	0.032617	37,62380	0.006254	0.138618	2000
GT10	48	AY2	0.015588	26,42995	0.005646	0.104459	2000
GT10	48	Z150	0.022634		0.003969		3000
GT12	24	AY2	0.026959	35,67183	0.006423	0.117663	3000
GT12	24	Z150	0.007722	35,79152	0.014160	0.152366	2000
GT12	48	AY2	0.031760	34,88461	0.038438	0.236857	2000
GT12	48	Z150	0.027163	74,22942	0.003662	0.999368	2000
GT14	24	AY2	0.001710	30,80037	0.004236	0.131069	3000
GT14	24	Z150	0.054494	40,72557	0.055896	0.239386	3000
GT14	48	AY2	0.005026	32,87946	0.025821	0.059202	3000
GT14	48	Z150	0.004039		0.003337		2000

- **FUTURE WORK AND COMMENTS**

The main issue during the work is that, the phthalocyanines are not compatible with titanium in terms of molecular structure.The carboxile groups of molecules may redesign.For this reason The chemistry group will try to synthesize new types of phthalocyanines which can attach the titanium layer better and make the efficiencies higher by improving the charge transport properities.

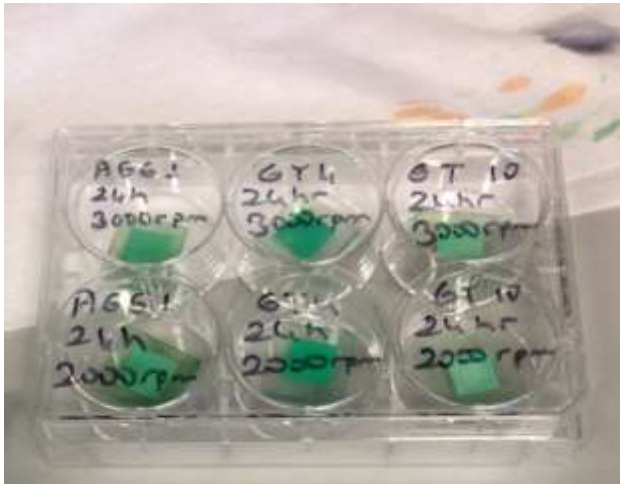


A future common research project could pursue under cost action.

CONCLUSIONS

We have designed and synthesized 5 asymmetrical phthalocyanine dyes containing hexylthia and carboxylic acid groups at peripheral and non-peripheral position of the macrocycle and incorporated into DSSC devices.

When the dye sensitization time was prolonged from 24 h to 48 h, the efficiency value of the solar cells sensitized by the GT10-cloroform solution (5.0 × 10−5 M) at 30 °C rose from 0.012240 to 0.032617 while the efficiency values of AGG1 remained almost constant.Therefore, AGG1 solar cell sensitized at 30 °C for 48 h exhibited the highest conversion efficiency of 0.169655% with I_{sc} = 0.0834 mA , V_{oc} = 0.44 V and FF = 0.45 under one simulated sun condition.



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