High stability of benzotriazole and benzodithiophene containing medium band-gap polymer solar cell

The improvement of polymer solar cell stability is a challenge for the scientists and has significant implications commercially. In this study, we investigated the stability of a novel P-SBTBDT active material applied in an inverted type solar cell. Detailed stability experiments comprising shelf life, laboratory weathering and outdoor testing were carried out according to ISOS testing guidelines. Shelf life showed that P-SBTBDT solar cells were very stable after 840 h with encapsulation. Although accelerated weathering aging tests are a very harsh, the devices remained stable after the burn-in phase with T50 from 700 to 840 h, with some P-SBTBDT solar cells did not reach T50 in the time span of the test. Degradation tests on the P-SBTBDT solar cells which were carried out under natural solar light indicated that T40 was reached after 840 h. The results of dark, light, damp and dry stability tests showed that most of the degradation was provoked by failure of the encapsulation. The experiments indicated that P-SBTBDT solar cells are sensitive to light and oxygen but are strikingly stable under humid conditions. Further developments for minimizing the degradation effects using UV-filters and better encapsulation are some of the necessary improvements in further research.
Baselines for Lifetime of Organic Solar Cells

The process of accurately gauging lifetime improvements in organic photovoltaics (OPVs) or other similar emerging technologies, such as perovskites solar cells is still a major challenge. The presented work is part of a larger effort of developing a worldwide database of lifetimes that can help establishing reference baselines of stability performance for OPVs and other emerging PV technologies, which can then be utilized for pass-fail testing standards and predicting tools. The study constitutes scanning of literature articles related to stability data of OPVs, reported until mid-2015 and collecting the reported data into a database. A generic lifetime marker is utilized for rating the stability of various reported devices. The collected data is combined with an earlier developed and reported database, which was based on articles reported until mid-2013. The extended database is utilized for establishing the baselines of lifetime for OPVs tested under different conditions. The work also provides the recent progress in stability of unencapsulated OPVs with different architectures, as well as presents the updated diagram of the reported record lifetimes of OPVs. The presented work is another step forward towards the development of pass-fail testing standards and lifetime prediction tools for emerging PV technologies.

General information

State: Published
Organisations: Department of Energy Conversion and Storage, Organic Energy Materials, Functional organic materials, ICREA - Institute of Photonic Sciences, University of Minho, Zurich University of Applied Sciences, CNRS, Institut Català de Nanociència i Nanotecnologia, Technische Universität Ilmenau, Cyprus University of Technology, Imperial College London
Authors: Gevorgyan, S. (Intern), Espinosa Martinez, N. (Intern), Ciammaruchi, L. (Ekstern), Roth, B. (Intern), Livi, F. (Intern), Tsopanidis, S. (Ekstern), Züfle, S. (Ekstern), Queirós, S. (Ekstern), Gregori, A. (Ekstern), Benatto, G. A. D. R.
Solution processable semiconductor oxides have opened a new paradigm for the enhancement of the lifetime of thin film solar cells. Their fabrication by low-cost and environmentally friendly solution-processable methods makes them ideal barrier (hole and electron) transport layers. In this work, we fabricate flexible ITO-free organic solar cells (OPV) by printing methods applying an aqueous solution-processed V2O5 as the hole transport layer (HTL) and compared them to devices applying PEDOT:PSS. The transparent conducting electrode was PET/Ag/PEDOT/ZnO, and the OPV configuration was PET/Ag/PEDOT/ZnO/P3HT:PC60BM/HTL/Ag. Outdoor stability analyses carried out for more than 900 h revealed higher stability for devices fabricated with the aqueous solution-processed V2O5.
Role of Stress Factors on the Adhesion of Interfaces in R2R Fabricated Organic Photovoltaics

The role of the common stress factors such as high temperature, humidity, and UV irradiation on interface adhesion of roll-to-roll fabricated organic photovoltaic (OPV) devices is investigated. The samples range from bare front electrodes to complete devices. It is shown that applying single stress or combinations of stresses onto the samples variably affect the adhesion properties of the different interfaces in the OPV device. It is revealed that while the exposure of the complete devices to the stresses results in the loss of photovoltaic performance, some interfaces in the devices present improved adhesion properties. Depth profiling analysis on the fractured samples reveals interdiffusion of layers in the structure, which results in the increase of adhesion and change of the debond path. It is shown that through diffusion and intermixing of internal interfaces coupled stresses can increase the adhesion of OPV interfaces by over tenfold. The results are additionally compared to the photovoltaic performance of the complete devices.
Roll-coating fabrication of flexible organic solar cells: comparison of fullerene and fullerene-free systems

Flexible organic solar cells (OSCs) based on a blend of low-bandgap polymer donor PTB7-TH and nonfullerene small molecule acceptor IEIC were fabricated via a roll-coating process under ambient atmosphere. Both an indium tin oxide (ITO)-free substrate and a flexible ITO substrate were employed in these inverted OSCs. OSCs with flexible ITO and ITO-free substrates exhibited power conversion efficiencies (PCEs) up to 2.26% and 1.79%, respectively, which were comparable to those of the reference devices based on fullerene acceptors under the same conditions. This is the first example for all roll-coating fabrication procedures for flexible OSCs based on non-fullerene acceptors with the PCE exceeding 2%. The fullerene-free OSCs exhibited better dark storage stability than the fullerene-based control devices.

Slot-Die-Coated V2O5 as Hole Transport Layer for Flexible Organic Solar Cells and Optoelectronic Devices

Vanadium pentoxide has been proposed as a good alternative hole transport layer for improving device lifetime of organic photovoltaics. The article presents a study on the optimization of slot-die-coated vanadium oxide films produced with a roll coating machine with the aim of achieving scalable organic solar cells and photo-detectors with improved performance. The effect of different diluents on the electrical properties of the vanadium oxide films is investigated, and methodologies for efficient interfacing of the anode are studied. Furthermore, the lifetime of the cells with incorporated vanadium oxide is
investigated employing different encapsulation methods. Finally, an application of the manufactured scalable devices in proximity sensors is demonstrated using a 3D-printed scaffold.

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Organisations: Department of Energy Conversion and Storage, Functional organic materials
Number of pages: 10
Pages: 1494-1503
Publication date: 2016
Main Research Area: Technical/natural sciences

Adsorbent 2D and 3D carbon matrices with protected magnetic iron nanoparticles
We report on the synthesis of two and three dimensional carbonaceous sponges produced directly from graphene oxide (GO) into which functionalized iron nanoparticles can be introduced to render it magnetic. This simple, low cost procedure, wherein an iron polymeric resin precursor is introduced into the carbon framework, results in carbon-based materials with specific surface areas of the order of 93 and 66 m² g⁻¹, compared to approx. 4 m² g⁻¹ for graphite, decorated with ferromagnetic iron nanoparticles giving coercivity fields postulated to be 216 and 98 Oe, values typical for ferrite magnets, for 3.2 and 13.5 wt% Fe respectively. The strongly magnetic iron nanoparticles are robustly anchored to the GO sheets by a layer of residual graphite, on the order of 5 nm, formed during the pyrolysis of the precursor material. The applicability of the carbon sponges is demonstrated in their ability to absorb, store and subsequently elute an organic dye, Rhodamine B, from water as required. It is possible to regenerate the carbon-iron hybrid material after adsorption by eluting the dye with a solvent to which it has a high affinity, such as ethanol. The use of a carbon framework opens the hybrid materials to further chemical functionalization, for enhanced chemical uptake of contaminants, or co-decoration with, for example, silver nanoparticles for bactericidal properties. Such analytical properties, combined with the material's magnetic character, offer solutions for environmental decontamination at land and sea, wastewater purification, solvent extraction, and for the concentration of dilute species.

General information
State: Published
A model for the impact of the nanostructure size on its gas sensing properties
The size of a metal oxide nanostructure plays a key role in its performance as a gas sensor. ZnO nanostructures with different morphologies including nanowires at different diameters and nanodisks at different thicknesses were synthesized hydrothermally. Gas sensors based on individual nanostructures with different sizes were fabricated and their sensing properties were compared and investigated. Nanowires with smaller diameter size and higher surface to volume ratio showed enhanced gas sensing performance. Also, as the nanodisk thickness gets closer to the thickness of the ZnO depletion layer, the sensitivity increases significantly due to the semi complete depletion of the nanostructure. Our results were explained using a modified general formula for a ZnO ethanol sensor. The formula was established based on the chemical reaction between ethanol molecules and oxygen ions and considering the effect of the surface to volume ratio as well as the depletion region of the nanostructure. This work can be simply generalized for other metal oxides to enhance their performance as gas sensors.

General information
State: Published
Organisations: Department of Energy Conversion and Storage, Functional organic materials, College of Technological Studies, Public Authority for Applied Education and Training, University of Hail, University of Surrey

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Journal: Nanoscale
Volume: 7
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BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 7.46 SJR 2.769 SNIP 1.459
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.842 SNIP 1.588 CiteScore 7.97
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.651 SNIP 1.676 CiteScore 7.64
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.55 SNIP 1.469 CiteScore 6.89
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.761 SNIP 1.346 CiteScore 6.08
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
Scopus rating (2011): SJR 2.494 SNIP 1.448 CiteScore 5.69
ISI indexed (2011): ISI indexed no
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Publication: Research - peer-review › Journal article – Annual report year: 2015
Equivalent Circuit Modeling for a High-Performance Large-Area Organic Photovoltaic Module

For organic photovoltaics (OPVs) to contribute significantly to energy generation, they need to be scaled to large areas, much like all organic electronics. Therefore, there is a need for the development of a specific model that describes the electrical properties related to the size effects and cell interconnections. We report here on the equivalent circuit models for a high-performance series connected OPV module based on a polymer:fullerene bulkheterojunction formulation. We examine the validity of the effective single cell methodology in the conventional framework and suggest a modified model that includes the net series resistance and additional parasitic leakage conductors. The photocurrent is found to follow the diffusion-limited voltage dependence, for which an empirical treatment enables an improved reproduction of the measurement near the short-circuit point.

General information
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Organisations: University of Surrey, Ecole Polytechnique
Authors: Kim, C. (Ekstern), Beliatis, M. (Intern), Gandhi, K. K. (Ekstern), Rozanski, L. J. (Ekstern), van Bonnassieux, Y. (Ekstern), Horowitz, G. (Ekstern), Silva, S. R. P. (Ekstern)
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Publication date: 2015
Main Research Area: Technical/natural sciences

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Journal: IEEE Journal of Photovoltaics
ISSN (Print): 2156-3381
Ratings:
Filtration properties of hierarchical carbonnanostructures deposited on carbon fibrefabrics
Hierarchical carbon nanostructures have been produced and examined for their use in liquid filtration experiments. The nanostructures are based on carbon nanotube growth and graphite oxide sponge deposition on the surface of commercially available carbon fibre fabrics. The hierarchical nanomaterial construction on the carbon fibre fabric is made possible due to the chemical vapour deposited carbon nanotubes which act as anchoring sites for the solution deposited sponge nanomaterial. The nanomaterials show a high capacity for Rhodamine B filtration, with the carbon fibre—carbon nanotube—graphite oxide sponge fabric showing filtering performance comparable to a commercial activated carbon filter. After 40 successive filtrations of 10 mg ml⁻¹ Rhodamine B solution, the filtrate of dual modified fabrics returned an increase in transparency of 94% when measured at approx. 550 nm compared to 72% for the commercial carbon filter. When normalised with respect to the areal density of the commercial filter, the increase in optical transparency of the filtrate from the dual modified fabrics reduces to 65%. The Rhodamine B is found to deposit in the carbon nanomaterials via a nucleation, growth and saturation mechanism.

General information
State: Published
Organisations: University of Surrey, Warsaw University of Technology
Authors: Kurzyp, M. (Ekstern), Mills, C. (Ekstern), Rhodes, R. (Ekstern), Pozegic, T. R. (Ekstern), Smith, C. T. (Ekstern), Beliatis, M. (Intern), Rozanski, L. (Ekstern), Werbowy, A. (Ekstern), Silva, S. (Ekstern)
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Web of Science (2017): Indexed yes
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Scopus rating (2016): CiteScore 2.07 SJR 0.645 SNIP 0.917
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.693 SNIP 1.046 CiteScore 2.1
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.069 SNIP 1.383 CiteScore 2.53
Web of Science (2014): Indexed yes
We report a ZnO interfacial layer based on an environmentally friendly aqueous precursor for organic photovoltaics. Inverted PCDTBT devices based on this precursor show power conversion efficiencies of 6.8–7%. Unencapsulated devices stored in air display prolonged lifetimes extending over 200 hours with less than 20% drop in efficiency compared to devices based on the standard architecture.

**High efficiency air stable organic photovoltaics with an aqueous inorganic contact**

We report a ZnO interfacial layer based on an environmentally friendly aqueous precursor for organic photovoltaics. Inverted PCDTBT devices based on this precursor show power conversion efficiencies of 6.8–7%. Unencapsulated devices stored in air display prolonged lifetimes extending over 200 hours with less than 20% drop in efficiency compared to devices based on the standard architecture.

**General information**

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Organisations: Shanghai Jiaotong University, University of Surrey
Hybrid and Nano-composite Carbon Sensing Platforms

General information
State: Published
Organisations: University of Surrey
Authors: Beliatis, M. (Intern), Rozanski, L. J. (Ekstern), Jayawardena, K. D. G. I. (Ekstern), Rhodes, R. (Ekstern), Anguita, J. (Ekstern), Mills, C. A. (Ekstern), Silva, S. R. P. (Ekstern)

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Title of host publication: Carbon for Sensing Devices
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Simultaneous optical and electrical modeling of plasmonic light trapping in thin-film amorphous silicon photovoltaic devices

Rapid prototyping of photovoltaic (PV) cells requires a method for the simultaneous simulation of the optical and electrical characteristics of the device. The development of nano-material-enabled PV cells only increases the complexity of such simulations. Here, we use a commercial technology computer aided design (TCAD) software, Silvaco Atlas, to design and model plasmonic gold nanoparticles integrated in optoelectronic device models of thin-film amorphous silicon (a-Si:H) PV cells. Upon illumination with incident light, we simulate the optical and electrical properties of the cell simultaneously and use the simulation to produce current–voltage (J–V) and external quantum efficiency plots. Light trapping due to light scattering and localized surface plasmon resonance interactions by the nano particles has resulted in the enhancement of both the optical and electrical properties due to the reduction in the recombination rates in the photoactive layer. We show that the device performance of the modeled plasmonic a-Si:H PV cells depends significantly on the position and size of the gold nano particles, which leads to improvements either in optical properties only, or in both optical and electrical properties. The model provides a route to optimize the device architecture by simultaneously optimizing the optical and electrical characteristics, which leads to a detailed understanding of plasmonic PV cells from a design perspective and offers an advanced tool for rapid device prototyping. © 2015 Society of Photo-Optical Instrumentation Engineers (SPIE)
ZnO hybrid photovoltaics with variable side-chain lengths of thienothiophene polymer

The effect of the side-chain length of poly(3,6-dialkylthieno[3,2-b]thiophene-co-bithiophene) (pATBT) on the performance of hybrid polymer-metal oxide photovoltaics (PVs) utilizing zinc oxide (ZnO) acceptor is investigated. The pATBT attached with a dodecyl side chain (pATBT-C12) in hybrid photovoltaics with ZnO was compared to pATBT with a hexadecyl side chain (pATBT-C16). Atomic force microscopic analysis reveals a smoother surface for the pATBT-C16 photoactive layer compared to the pATBT-C12. For hybrid PVs using pATBT-C16, the relative intensity of the external quantum efficiency (EQE) increased particularly in wavelength region associated with the ZnO. Furthermore, the EQE spectrum shows a red shift for pATBT-C16 indicating better structural ordering compared to hybrid PVs with pATBT-C12. As a result, the hybrid PV utilizing pATBT-C16:ZnO blend layer is observed to display a better performance with a power conversion efficiency of 1.02% compared to 0.672% of pATBT-C12:ZnO PV. © 2014 Elsevier B.V. All rights reserved.
A Critical Look at Organic Photovoltaic Fabrication Methodology: Defining Performance Enhancement Parameters Relative to Active Area

With the ever-increasing focus on obtaining higher device power conversion efficiencies (PCEs) for organic photovoltaics (OPV), there is a need to ensure samples are measured accurately. Reproducible results are required to compare data across different research institutions and countries and translate these improvements to real-world production. In order to report accurate results, and additionally find the best-practice methodology for obtaining and reporting these, we show that careful analysis of large data sets can identify the best fabrication methodology. We demonstrate which OPV outputs are most affected by different fabrication or measurement methods, and identify that masking effects can result in artificially-boosted PCEs by increasing fill factor and current densities, requiring care when selecting which mask to use. For example, our best performing devices (46% efficiency) show that the smallest mask areas have not produced a surfeit of the highest performers, with only 11% of the top performing devices measured using a 0.032 cm² mask area, while 44% used the largest mask (0.64 cm²). This trend holds true for efficiencies going down to 5%, showing that effective fabrication conditions are reproducible with increasing mask areas, and can be translated to even larger device areas.
Finally, we emphasise the necessity for reporting the best PCE along with the average value in order to implement changes in real-world production. © 2014 Elsevier B.V. All rights reserved.
Hybrid Graphene-Metal Oxide Solution Processed Electron Transport Layers for Large Area High-Performance Organic Photovoltaics

Solution processed core-shell nano-structures of metal oxide-reduced graphene oxide (RGO) are used as improved electron transport layers (ETL), leading to an enhancement in photocurrent charge transport in PCDTBT:PC 70BM for both single cell and module photovoltaic devices. As a result, the power conversion efficiency for the devices with RGO-metal oxides for ETL increases 8% in single cells and 20% in module devices. © 2014 The Authors. Published by WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.
Silver grid transparent conducting electrodes for organic light emitting diodes

Polymer organic light emitting diodes (OLEDs) were fabricated using thin silver hexagonal grids replacing indium tin oxide (ITO) as the transparent conducting electrodes (TCE). Previous literature has assumed that thick metal grids (several hundred nanometres thick) with a lower sheet resistance (<10 Ω/square) and a similar light transmission (>80%) compared to thinner grids would lead to OLEDs with better performance than when thinner metal grid lines are used. This assumption is critically examined using OLEDs on various metal grids with different thicknesses and studying their performances. The experimental results show that a 20 nm thick silver grid TCE resulted in more efficient OLEDs with higher luminance (10 cd/A and 1460 cd/m² at 6.5 V) than a 111 nm thick silver grid TCE (5 cd/A and 159 cd/m² at 6.5 V). Furthermore, the 20 nm thick silver grid OLED has a higher luminous efficiency than the ITO OLED (6 cd/A and 1540 cd/m² at 6.5 V) at low voltages. The data shows that thinner metal grid TCEs (about 20 nm) make the most efficient OLEDs, contrary to previous expectations. © 2014 Elsevier B.V. All rights reserved.
Inorganics-in-Organics: Recent Developments and Outlook for 4G Polymer Solar Cells

Recent developments in solution processable single junction polymer solar cells have led to a significant improvement in power conversion efficiencies from 5% to beyond 9%. While much of the initial efficiency improvements were driven through judicious design of donor polymers, it is the engineering of device architectures through the incorporation of inorganic nanostructures and better processing that has continued the efficiency gains. Inorganic nano-components such as carbon nanotubes, graphene and its derivatives, metal nanoparticles and metal oxides have played a central role in improving device performance and longevity beyond those achieved by conventional 3G polymer solar cells. The present work aims to summarise the diverse roles played by the nanosystems and features in state of the art next generation (4G) polymer solar cells. The challenges associated with the engineering of such devices for future deployment are also discussed.

General information
State: Published
Organisations: University of Surrey
Authors: Jayawardena, K. I. (Ekstern), Rozanski, L. J. (Ekstern), Mills, C. A. (Ekstern), Beliatis, M. (Intern), Nismy, N. A. (Ekstern), Silva, S. R. P. (Ekstern)
Laser implantation of plasmonic nanostructures into glass

A laser direct-writing method producing high-resolution patterns of gold, silver and alloy plasmonic nanoparticles implanted into the surface of glass substrates is demonstrated, by scanning a pulsed UV laser beam across selected areas of ultra-thin metal films. The nanoparticles are incorporated beneath the surface of the glass and hence the patterns are scratch-resistant. The physical mechanisms controlling the process are investigated and we demonstrate that this technique can be used to fabricate a wide range of plasmonic optical structures such as wavelength selected diffraction gratings and high-density substrates for lab-on-chip surface-enhanced Raman spectroscopy.
Organic solar cells with plasmonic layers formed by laser nanofabrication

A method for the synthesis of metal nanoparticle coatings for plasmonic solar cells which can meet large scale industrial demands is demonstrated. A UV pulsed laser is utilized to fabricate Au and Ag nanoparticles on the surface of polymer materials which form the substrates for plasmonic organic photovoltaic devices to enhance their performance. Control of the particles' size and density is demonstrated. The optical and electrical effects of these embedded particles on the power conversion efficiency are examined rigorously using both experimental and computer simulation. Gold nanoparticles of particular size and spatial distribution enhance the device efficiency. Based on our findings, we propose design considerations for utilizing the entire AM1.5 spectrum using plasmonic structures towards enhancing the efficiency of polymer solar cells using broad spectrum plasmonics.

General information
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Organisations: University of Surrey, Foundation for Research and Technology-Hellas, Technological Educational Institute of Crete
Authors: Beliatis, M. J. (Intern), Henley, S. J. (Ekstern), Han, S. (Ekstern), Gandhi, K. (Ekstern), Adikaari, A. A. D. T. (Ekstern), Stratakis, E. (Ekstern), Kymakis, E. (Ekstern), Silva, S. R. P. (Ekstern)
Pages: 8237-8244
Publication date: 2013
Main Research Area: Technical/natural sciences

Publication information
Journal: Physical Chemistry Chemical Physics
ZnO nanostructures with different morphologies (nanowires, nanodisks, and nanostars) were synthesized hydrothermally. Gas sensing properties of the asgrown nanostructures were investigated under thermal and UV activation. The performance of the ZnO nanodisk gas sensor was found to be superior to that of other nanostructures (Sg ∼ 3700% to 300 ppm ethanol and response time and recovery time of 8 and 13 s). The enhancement in sensitivity is attributed to the surface polarities of the different structures on the nanoscale. Furthermore, the selectivity of the gas sensors can be achieved by controlling the UV intensity used to activate these sensors. The highest sensitivity value for ethanol, isopropanol, acetone, and toluene are recorded at the optimal UV intensity of 1.6, 2.4, 3.2, and 4 mW/cm², respectively. Finally, the UV activation mechanism for metal oxide gas sensors is compared with the thermal activation process. The UV activation of analytes based on solution processed ZnO structures pave the way for better quality gas sensors.
Solution Processed Reduced Graphene Oxide/metal Oxide Hybrid Electron Transport Layers for Highly Efficient Polymer Solar Cells

We report new solution processable electron transport layers for organic photovoltaic devices based on composites of metal oxides and reduced graphene oxides. Low bandgap polymer cells fabricated using these nanohybrid transport layers display power conversion efficiencies in the range of 7.4–7.5% which is observed to be an improvement over conventional metal oxide or thermally evaporated electron transport layers. This efficiency enhancement is driven mainly by improvements in the short circuit current (from 14.8 to 15.0 mA cm\(^2\)) as well as the fill factor (65% to 68%) upon the inclusion of reduced graphene oxide with the metal oxides. This is attributed to the reduced graphene oxide providing charge transfer pathways between the metal oxide nanoparticles. In addition, the metal oxide/reduced graphene oxide nanohybrids also lead to more balanced electron and hole mobilities which assist in the improvement of the fill factor of the device. The versatile nature of these nanohybrids is increased due to the wrapping of the graphene layers around the metal oxide nanoparticles, which leads to very smooth films with surface roughness of 3 nm. The improvement observed in this study upon the incorporation of RGO as well as the solution processable nature of the interfacial layers brings the organic photovoltaic technology a step closer towards realising an all solution processed solar cell.

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Organisations: University of Surrey
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Publication date: 2013
Main Research Area: Technical/natural sciences

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Volume: 1
ISSN (Print): 2050-7488
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Web of Science (2017): Indexed yes
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Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.672 SNIP 1.663 CiteScore 8.36
Engineering the plasmon resonance of large area bimetallic nanoparticle films by laser nanostructuring for chemical sensors

Large area fabrication of metal alloy nanoparticles with tunable surface plasmon resonances on low-cost substrates is reported. A UV excimer laser was used to anneal 5nm thick Ag Au bilayer films deposited with different composition ratios to create alloy nanoparticles. These engineered surfaces are used to investigate how the wavelength of the surface plasmon resonance affects the optical detection capability of chemical species by surface-enhanced Raman spectroscopy.

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General information
State: Published
Organisations: University of Surrey
Authors: Beliatis, M. J. (Intern), Henley, S. J. (Ekstern), Silva, S. R. P. (Ekstern)
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Publication date: 2011
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BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.54 SJR 1.864 SNIP 1.658
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.142 SNIP 1.642 CiteScore 3.53
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.497 SNIP 2.056 CiteScore 3.86
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.458 SNIP 2.095 CiteScore 3.95
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.596 SNIP 1.95 CiteScore 3.52
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.518 SNIP 2.475 CiteScore 3.69
ISI indexed (2011): ISI indexed yes
Laser Ablation Direct Writing of Metal Nanoparticles for Hydrogen and Humidity Sensors

A UV pulsed laser writing technique to fabricate metal nanoparticle patterns on low-cost substrates is demonstrated. We use this process to directly write nanoparticle gas sensors, which operate via quantum tunnelling of electrons at room temperature across the device. The advantages of this method are no lithography requirements, high precision nanoparticle placement, and room temperature processing in atmospheric conditions. Palladium-based nanoparticle sensors are tested for the detection of water vapor and hydrogen within controlled environmental chambers. The electrical conduction mechanism responsible for the very high sensitivity of the devices is discussed with regard to the interparticle capacitance and the tunnelling resistance.

General information
State: Published
Organisations: University of Surrey, National Physical Laboratory
Authors: Beliatis, M. J. (Intern), Martin, N. A. (Ekstern), Leming, E. J. (Ekstern), Silva, S. R. P. (Ekstern), Henley, S. J. (Ekstern)
Pages: 1241–1244
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Main Research Area: Technical/natural sciences

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Volume: 27
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**Projects:**

**CHEETAH FP7**
CHEETAH - Cost-reduction through material optimisation and Higher EnErgy output of solAr pHotovoltaic modules - joining Europe’s Research and Development efforts in support of its PV industry - is a combined collaborative project (CP) and coordination and support action (CSA) funded under the European Commission’s 7th Framework programme. CHEETAH’s aims to solve specific R&D issues in the EERA-PV Joint Program and to overcome fragmentation of European PV R&D in Europe and intensify the collaboration between R&D providers and industry to accelerate the industrialization of innovations.

Department of Energy Conversion and Storage

Functional organic materials
Period: 21/07/2014 → ...
Number of participants: 1
Project participant:
Beliatis, Michail (Intern)

**SMARTONICS FP7**
The target of the Smartonics project is the development of Pilot lines that will combine smart technologies with smart nanomaterials for the precision synthesis of Organic Electronic (OE) devices

Department of Energy Conversion and Storage

Functional organic materials
Period: 01/01/2013 → 01/08/2014
Number of participants: 1
Project participant:
Beliatis, Michail (Intern)

**Hybrid metal-graphene nanostructured materials for innovative plasmonic electrodes**

Department of Energy Conversion and Storage

Functional organic materials
Period: 01/03/2012 → 01/03/2014
Number of participants: 1
Acronym: UK EPSRC Postdoctoral Prize Fellowship
Project participant:
Beliatis, Michail (Intern)

**Solar Hydrogen Fuel Production Station**

Department of Energy Conversion and Storage

Functional organic materials
Period: 31/10/2011 → 01/09/2012
Number of participants: 1
Acronym: UK Knowledge Transfer Account (KTA)
Project participant:
Beliatis, Michail (Intern)