Quantum Dot Solar Cells

Description: The report Quantum Dot Solar Cells 2016 earmarks the immense potential that this technology holds for the future of mankind and the crucial impact it will have on the process of introduction of solar energy into large scale arenas of the industrialized economies. The report on Quantum Dot Solar Cells initiates with a strong theoretical understanding of the Solar Cell system and their subsequent propagation into photovoltaic systems including their applications derived from generational leaps as first to third generation cells. The research offering presents the entire gamut of PV cells in a structured family tree for easy interpretation and also delves into the applications of PV Technology in isolated environment.

The report also devotes an entire in depth section to the technical aspects of Quantum Dot Solar Cell systems including their history as well as mechanism, general operation principles and the new innovations in architecture design of Quantum Dot Solar Cells which have opened up new markets for solar power systems. These are further explained in the efficient design choices of various configurations and new ideas contributed in this field.

The report further analyzes the processing techniques of Quantum Dot Solar Cells and a brief section is also dedicated to quantum dot solar concentrators. In order to address the efficiency factors which impact the Quantum Dot Solar Cells systems the report examines the application on nanostructures to this with a complete overview on the two major techniques in use today. An analysis is also presented of the leading companies making waves in this relatively new field of Quantum Dot Solar Cells.

The presentation Quantum Dot Solar Cells 2016 is a very comprehensive tool for understanding this technology in a in depth manner and deliver thought provoking views on the marvels of this field which is nature’s helping hand lent to mankind in order to preserve a way of life which is sustainable as well as in sync with our environment.

Contents: A. Executive Summary

B. What are Quantum Dots?
B.1 Overview of Quantum Dots
B.2 Looking at Quantum Confined Semiconductors
B.3 How to Make Quantum Dots
B.3.1 Synthesis of Colloidal Semiconductor Nanocrystals
B.3.2 Fabrication Process
B.3.3 Viral Assembly
B.3.4 Self-Assembly by Electrochemical Methods
B.3.5 Bulk Manufacturing
B.3.6 Problem with Cadmium-based Quantum Dots
B.4 Looking at Optical Properties of Quantum Dots
B.5 Application Areas of Quantum Dots
B.5.1 Overview
B.5.2 Uses in Biology
B.5.3 Uses in Quantum Computation
B.5.4 Role in Photovoltaics
B.5.5 Uses in Light Emitting Devices
B.6 Endless Possibilities of Quantum Dots

C. Introduction to Photovoltaics
C.1 Overview
C.2 Historical Background of Solar Cells
C.3 Looking at Solar Electricity
C.4 Photovoltaic Systems
C.5 Looking at the Balance of System (BOS)
C.6 Analyzing the 3 Generations of Photovoltaic Cells
C.6.1 First Generation PV Cells
M.13 Summing Up

N. Analyzing Quantum Dot Intermediate Band Solar Cells
N.1 Overview
N.2 How to Design the Quantum Dot
N.3 Coupling of Quantum Dot
N.4 Process of Quantum Dot Doping

O. Analysis of Quantum Dot Solar Concentrators
O.1 Overview
O.2 What is the Quantum Dot Concentrator?
O.3 Modeling of the Concentrator
O.4 Looking at the 3-D Models
O.5 Analysis of Results
O.6 Summing Up

P. Case Studies
P.1 Manufacturing Multi-Stacked Quantum Dots in Higher Efficiency Solar Cells
P.2 Developing a Silicon Quantum Dot Structure for Silicon Tandem Solar Cells

Q. Leading Industry Contributors
Q.1 Cyrium Technologies
Q.2 E. I. du Pont de Nemours and Company
Q.3 Kopin Corporation
Q.4 NanoMas Technologies
Q.5 Natcore Technology Inc.
Q.6 Quantum PV
Q.7 QuNano
Q.8 Sol Voltaics
Q.9 Solterra Renewable Technologies Inc
Q.10 Voxel

R. Appendix
R.1 Using Tandem Solar Cells for Increased Efficiency
R.1.1 Overview
R.1.2 Design Considerations
R.1.3 Performance Characteristics
R.1.4 Fabrication of Tandem Solar Cells on Silicon
R.1.5 Facing the Challenge for High Conversion Efficiency
R.2 Figures & Tables

S. Glossary of Terms

List of Figures:
Figure 1: A Solar Cell Made from a Monocrystalline Silicon Wafer
Figure 2: Installed PV Capacity by Technology in 2015
Figure 3: Annual Market (MW) and Annual Growth Rate (%)
Figure 4: Global PV Capacity Growth & Forecast
Figure 5: Regional Breakdown of Global PV Markets
Figure 6: Dye Sensitized Solar Cell
Figure 7: Hybrid Nanorod-Polymer Solar Cell
Figure 8: Electrical Model of a Solar Cell
Figure 9: I-V Characteristics of an Ideal Solar Cell
Figure 10: Multicolor Simulator
Figure 11: Energy Relaxation of Carriers after a Short, High-Intensity Laser Pulse at t = 0
Figure 12: Schematic of an IBSC
Figure 13: Room-Temperature Photoluminescence Spectra and a 5×5µm Atomic Force Microscope Image from an Indium-Nitride Sample with a High Density of Dots
Figure 14: Energy Band Structure of a Single Joint Type Solar Cell and the Main Energy Loss Factor
Figure 15: Drawing of Quantum Dot Solar Battery Structure
Figure 16: Quantum Dot Solar Battery Energy Band
Figure 17: Mini Band
Figure 18: Heat Processed Silicon Quantum Dot Structure
Figure 19: High Resolution Transmission Electron Microscope Imaging of Nanoporous Silica
Figure 20: Density of States (DOS) in the Semiconductors; (a) 0D (Quantum Dot), (b) 1D (Quantum Wire), (c) 2D (Quantum Well), and (d) 3D (Bulk)
Figure 21: Energy Band Diagrams for p-i-n Type Single-Junction Solar Cells using MQW Absorber
Figure 22: Energy Band Diagrams for p-i-n Type Single-Junction Solar Cells using SL Absorber
Figure 23: Valence and Conduction Band Levels for Nanorod-shaped CdTe and CdSe Films
Figure 24: Hot Carrier Relaxation/Cooling Dynamics in Semiconductors
Figure 25: Enhanced PV Efficiency in QD Solar Cells by MEG (Inverse Auger Effect)
Figure 26: Structure of an Intermediate Band Material, Showing the Possible Optical Transitions
Figure 27: Difference in Electronic States between MQW Structures & Superlattices
Figure 28: 3-D plots of PL intensity versus time and photon energy
Figure 29: Band Diagram for a QD
Figure 30: Dot Potential vs. Radius
Figure 31: Quantum Dot Solar Cell Structure
Figure 32: Quantum Dot Solar Cell Structure
Figure 33: Principle of a Tandem Cell
Figure 34: Quantum Confinement

List of Tables:
Table 1: Cost Breakdown for a 100 kWP-10 MWP Concentrator Photovoltaics Installation
Table 2: Module Component Materials Cost for Thin Film Cadmium Telluride Systems
Table 3: Annual Market (MW) and Annual Growth Rate (%)
Table 4: Industry Forecast for Major Worldwide Yearly PV Markets in MW
Table 5: Production Capacities Forecast by End of 2020

Ordering:
Order Online - http://www.researchandmarkets.com/reports/1085875/
Order by Fax - using the form below
Order by Post - print the order form below and send to

Research and Markets,
Guinness Centre,
Taylors Lane,
Dublin 8,
Ireland.
Fax Order Form
To place an order via fax simply print this form, fill in the information below and fax the completed form to 646-607-1907 (from USA) or +353-1-481-1716 (from Rest of World). If you have any questions please visit
http://www.researchandmarkets.com/contact/

Order Information
Please verify that the product information is correct and select the format(s) you require.

| Product Name: | Quantum Dot Solar Cells |
| Web Address:  | http://www.researchandmarkets.com/reports/1085875/ |
| Office Code:  | SC |

Product Formats
Please select the product formats and quantity you require:

<table>
<thead>
<tr>
<th>Quantity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic (PDF) - Single User:</td>
<td>USD 700</td>
</tr>
<tr>
<td>Electronic (PDF) - Site License:</td>
<td>USD 1000</td>
</tr>
<tr>
<td>Hard Copy:</td>
<td>USD 1250 + USD 56 Shipping/Handling</td>
</tr>
<tr>
<td>CD-ROM:</td>
<td>USD 1250 + USD 56 Shipping/Handling</td>
</tr>
<tr>
<td>Electronic (PDF) - Enterprisewide:</td>
<td>USD 1250</td>
</tr>
</tbody>
</table>

* Shipping/Handling is only charged once per order.
* The price quoted above is only valid for 30 days. Please submit your order within that time frame to avail of this price as all prices are subject to change.

Contact Information
Please enter all the information below in BLOCK CAPITALS

<table>
<thead>
<tr>
<th>Title:</th>
<th>Mr [ ] Mrs [ ] Dr [ ] Miss [ ] Ms [ ] Prof [ ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Name:</td>
<td>____________________________________________</td>
</tr>
<tr>
<td>Email Address: *</td>
<td>____________________________________________</td>
</tr>
<tr>
<td>Job Title:</td>
<td>____________________________________________</td>
</tr>
<tr>
<td>Organisation:</td>
<td>____________________________________________</td>
</tr>
<tr>
<td>Address:</td>
<td>____________________________________________</td>
</tr>
<tr>
<td>City:</td>
<td>____________________________________________</td>
</tr>
<tr>
<td>Postal / Zip Code:</td>
<td>____________________________________________</td>
</tr>
<tr>
<td>Country:</td>
<td>____________________________________________</td>
</tr>
<tr>
<td>Phone Number:</td>
<td>____________________________________________</td>
</tr>
<tr>
<td>Fax Number:</td>
<td>____________________________________________</td>
</tr>
</tbody>
</table>

* Please refrain from using free email accounts when ordering (e.g. Yahoo, Hotmail, AOL)
Payment Information

Please indicate the payment method you would like to use by selecting the appropriate box.

☐ Pay by credit card: You will receive an email with a link to a secure webpage to enter your credit card details.

☐ Pay by check: Please post the check, accompanied by this form, to:
Research and Markets,
Guinness Center,
Taylors Lane,
Dublin 8,
Ireland.

☐ Pay by wire transfer: Please transfer funds to:
Account number 833 130 83
Sort code 98-53-30
Swift code ULSBIE2D
IBAN number IE78ULSB98533083313083
Bank Address Ulster Bank,
27-35 Main Street,
Blackrock,
Co. Dublin,
Ireland.

If you have a Marketing Code please enter it below:

Marketing Code: ____________________________

Please note that by ordering from Research and Markets you are agreeing to our Terms and Conditions at http://www.researchandmarkets.com/info/terms.asp

Please fax this form to:
(646) 607-1907 or (646) 964-6609 - From USA
+353-1-481-1716 or +353-1-653-1571 - From Rest of World