ISBN : 978-1-5090-1708-9

6

PROCEEDING

INTERNATIONAL SEMINAR ON INTELLIGENT TECHNOLOGY AND ITS APPLICATION

RECENT TRENDS IN INTELLIGENT COMPUTATIONAL TECHNOLOGIES FOR SUSTAINABLE ENERGY

28th–30th July 2016
LOMBOK, INDONESIA

isitia.its.ac.id

Proceedings

2016 International Seminar on Intelligent Technology and Its Application (ISITIA)

IEEE Catalog Number:	CFP16TIA-USB
ISBN:	978-1-5090-1708-9

Additional copies of this proceeding may be ordered to:
Department of Electrical Engineering
Institut Teknologi Sepuluh Nopember
Gd. B, C & AJ, Kampus ITS Sukolilo
Surabaya, Indonesia 60111

Converting Solar Energy to Electricity Energy using Diffractive and Selective Crystalline Photonics

Bernard Y. Tumbelaka. Darmawan Hidayat,
Mohammad Taufik, Dessy Novita, Nendi Suhendi
Electrical Engineering Department, Faculty of Mathematics and Natural Sciences,, University of Padjadjaran
Jatinangor 45363, Sumedang, Indonesia
Email: btumbelaka@ymail.com

***Abstract*— currently, elctrical feasibility of product and its distribution services has more raised. Converting solar energy to electricity energy by use of photovoltaic cell (PV) is key element to get energy supply for our society profitable in the future. By using the rule of photonics is potentially promising to produce PV solar energy of semiconductor material that captures sunlight and changes its energy become DC electrical current. This technology gives advantage by resulting and storing this energy in PV cell structured that comes from a broadband range of sunlight spectral to improve its performance system such as to optimize the PV solar cell efficiency by using selectivity spectral crystalline photonic properties. We required to collect and store this sun energy that could be utilized any time and whenever this energy needed. Researcher at PV's field is brought up on problem how to increase this conversion process efficiency with cost as cheap as possible Selectivity spectral is the only methods to guide partly solar spectrum that is sorted for specific solar cell. It accords absorption of spectrum particular part by solar cell. Selectivity spectral can be reached by fluorescent concentrator and in photonics structured. Another selectivity spectral technique is angular confinement of the light trapping inside solar cell. On solar cell type with light propagation direction is always near normal direction. Then with change of normal light will give positive effect on internal path length, also ensues to increase absorption into solar cell. By using diffraction grating will add some diffraction order that influences to increase light path length. First, this causes to increase its absorption more than 74%. Second, it causes to raise generating on electricity charging and solar cell efficiency varied to 85%.**

Keywords—solar energy conversion; photovoltaic (PV); selectivity spectral;

II. INTRODUCTION

Today energy crisis raises many questions about the viability of future products and services of energy supply. All these must take into account society's needs, energy challenges and sustainability concerns. Photonics [1,2,3] has potentially been promising for the future products and services at the same time. The importance to understand photonics is how optics can be used for applications that help protect the environment.

TABEL 1. DIFFERENT TYPES OF PHOTONICS TECHNOLOGY AND THEIR IMPACTS

Nr	Technology	Component Technology	Application	Impact
1	Photovoltaics	xSi. pSi, aSi:H [4], CdTe	Power generation	Renewable energy, induced carbon emissions, reduced pollution
2	Photonics lighting/Solid state lighting (SSL)	LED. OLED	Ilumination, Displays	Reduced energy consumption, reduce mercury pollution
3	UV Disinfection	LED UV	Water purification	Improved dqinking water. quality, reduced mercury pollution
4	Optical Sensors	Fiber Optics,i Bragg grating, Detectors	Energy Extraction, Gas sensing, environement monitoring	Reduced energy consumption, Reduced pollution, Reduced green house gas emission
5	Low Power Displays	OLED,s, LEDs,, MEMs. Electrophor etics, LCDs	Info and Entertaineme Display	Reduced energy consumption

This paper gives an overview of the role of photonics in the area of solar energy production covering the efficient improvement of solar cell using crystalline photonics also the future aspects and advantages of photonic technology. (See table 1)

This environment pollution is growing in numbers causing some of serious defects such as global warming, climate changing which are not only affecting human beings but also other living species as well as entire bio-diversity of the earth. The apllication of photonics is not only in solar energy production but can generate energy such as photovoltaic electricity generation with higher efficiency, and new energy efficient communication technologies, optical sensing for improved energy efficiency and reduce energy consumption.

978-1-5090-1709-6/16/$31.00 ©2016 IEEE