

## PERFORMANCE EVALUATION OF VARIOUS PV MODULES TECHNOLOGIES IN POLAND

**Agata Zdyb, Sławomir Gułkowski and Piotr Dragan**

Lublin University of Technology, Poland



**D**ue to human population growth, spreading of technology and consumption rise the energy demand of our civilization increased rapidly during last decades. The depletion of fossil fuels forces us to develop new alternative energy sources. Among them solar radiation has the largest potential which can be utilized in the process of photovoltaic conversion which provides the most useful energy form, electric energy. The aim of the presented work is to compare different photovoltaic (PV) technologies performance under real operation conditions in East part of Poland (warm summer continental climate according to Köppen's climate classification). The study is based on the data collected during 2015-2016 period at photovoltaic plant which consists of polycrystalline modules (1390 kWp of nominal power) as well as thin film CdTe, amorphous silicon and copper indium gallium (di)selenide (CIGS) modules (3.3 kWp, 3.42 kWp, 3.72 kWp, respectively). Simultaneously with monitoring of energy production at the PV plant, measurements of solar irradiation and module temperature was carried out by adequate sensors and all the received data were registered every five minutes during the considered period of time. The results show that monthly yield as well as performance ratio of CIGS modules is good comparing to other installed technologies, especially during summer months. The significant impact of temperature is visible in case of pc-Si in contrast to CIGS technology which has the lowest temperature related losses. Prediction of performance and assessment of diverse PV technologies in the given location are significant and allow avoiding over or under estimation of installations at the planning stage.

### Recent Publications

1. Zdyb A and Krawczyk S (2010) Molecule-solid interaction: Electronic states of anthracene-9-carboxylic acid adsorbed on the surface of TiO<sub>2</sub>. *Applied Surface Science* 256:4854-4858.
2. Krawczyk S and Zdyb A (2011) Electronic Excited States of Carotenoid Dyes Adsorbed on TiO<sub>2</sub>. *Journal of Physical Chemistry C* 115:22328-22335.
3. Zdyb A and Krawczyk S (2014) Adsorption and electronic states of morin on TiO<sub>2</sub> nanoparticles. *Chemical Physics* 443:61-66.
4. Zdyb A and Krawczyk S (2016) Characterization of adsorption and electronic excited states of quercetin on titanium dioxide nanoparticles. *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy* 157:197-203.

### Biography

Agata Zdyb has received her PhD in 2002 from Gdansk University of Technology in Poland. She has completed her Habilitation degree from AGH University of Science and Technology in 2012, with her thesis titled as "The research on the improvement of dye-sensitized solar cells efficiency". She is the Head of the Institute of Renewable Energy Engineering at Lublin University of Technology, Poland. She is an author and co-author of more than 70 publications in international and Polish journals and conference contributions. Her scientific topics of interest are: thin film solar cells, dye-sensitized solar cells (DSSC), photovoltaic systems, organic dyes for applications in DSSC, renewable energy sources, nanotechnology.

[a.zdyb@pollub.pl](mailto:a.zdyb@pollub.pl)