Book review

The Sun and Photovoltaic Technologies

by

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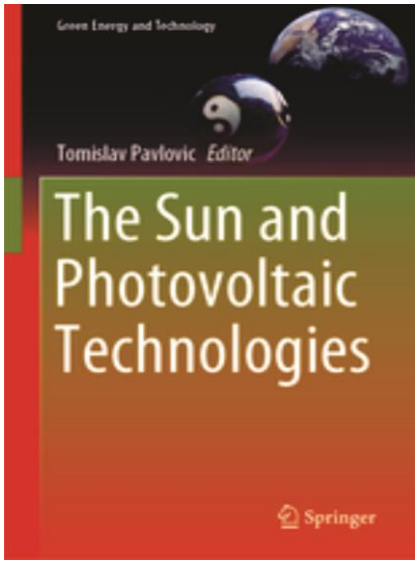

In November 2019 Springer Verlag published a monograph THE SUN AND PHOTOVOLTAIC TECHNOLOGIES, edited by Tomislav M. Pavlović with contribution by Tomislav M. Pavlović, Aris Tsangrassoulis, Nikola Dj. Cekić, Plamen Ts. Tsankov, Dragoljub Lj. Mirjanić and Ivana S. Radonjić Mitić.

The book has 416 pages, 7 chapters (Solar energy, Photovoltaic solar energy conversion, Solar lighting, Lighting technologies, Solar energy and lighting in Serbia, Solar energy and lighting in Bulgaria, Solar energy and lighting in the Republic of Srpska), 398 figures, 48 tables and 345 references.

In the first chapter Solar energy general information about the Sun (interior of the Sun, atmosphere of the Sun, origin of the solar energy), solar radiation (extraterrestrial solar radiation, terrestrial solar radiation), solar radiation measurements (measurement of sunshine duration, measurement of direct solar radiation intensity, measurement of intensity of global and diffuse solar radiation) and solar radiation on an inclined surface is given. Furthermore, propagation of solar radiation through atmosphere (atmosphere, absorption in atmosphere, atmospheric scattering, atmospheric refraction, scintillation in atmosphere, solar radiation extinction coefficient, and the greenhouse effect) is dealt with. In addition, the Earth revolution (ecliptic, zenith, altitude and azimuth angle, precession and nutation, night and day, temperature zones of the Earth) is described.

The second chapter Photovoltaic solar energy conversion comprises general information (historical overview, principles of solar cell operation, output parameters of solar cell, materials for solar cells, coefficient of absorption, solar cells spectral sensitivity, efficiency of solar cells, factors influencing solar cells efficiency). Then, full attention is paid to silicon solar cells (silicon, polycrystalline silicon, monocrystalline silicon, amorphous silicon, polycrystalline silicon solar cells, monocrystalline silicon solar cells, amorphous silicon solar cells on glass and plastic substrate). Other solar cells are described (GaAs solar cells, CdTe solar cells, CIS solar cells, organic solar cells, multiple solar cells, solar cells with concentrators,

development of solar cells efficiency). Data on solar modules (solar cells connecting, basic characteristics of solar modules, standard test conditions for solar modules, solar modules mounting, solar modules shading, solar generator) are included. Information on solar batteries is also provided (basic characteristics of batteries, lead-acid, VRLA, Gel, AGM, Li-ion, nickel-cadmium, nickel-metal hydride, solar armor plate and solar block batteries, solar batteries wiring, battery requirements, maintenance and storage, batteries for electric cars). Further focus is on charge controller, inverter and solar cells application (stand-alone PV systems, determining characteristics of the stand-alone photovoltaic solar system, grid connected photovoltaic solar system), urban application of PV systems (general remarks, BIPV systems, examples of BIPV systems) and rural application of PV systems. Data on the following are also provided: PV solar power plants (fixed PV solar power plants, one-axis and dual-axis tracking PV solar power plant, software for the calculation of the PV solar power plants energy efficiency, PVGIS-CMSAF software, list of PV solar power plants larger than 150 MW), solar module efficiency dependence on their orientation and tilt angle, solar modules soiling (dust, solar modules efficiency dependence on soiling, cleaning and maintenance of solar modules, protection of solar modules from bird droppings), smart systems and mini grids (distributed generation of electricity, connection of a small scale power plant to the distribution network, the impact of distributed generation on the distribution network, smart grids, power consumption, energy needs), economy of PV systems (introduction, solar cells production, PV installation, PV market, installed cost trends, levelised cost of electricity, energy payback time) and sustainability of the green economy.

In the third chapter Solar lighting information on solar lighting, façade systems (light-shelves, blinds, holographic optical elements) and daylight transfer systems (DTS) is given.

The fourth chapter Lighting technologies informs on Lighting fundamentals (nature of the light, light quantities, color characteristics of light sources), light sources (incandescence, luminescence (photoluminescence, electroluminescence, miscellaneous luminescence phenomena), a brief history of light sources, incandescence lamps, tungsten-halogen lamps, low and high pressure mercury discharge lamps (fluorescent lamps, high pressure mercury lamps), metal halide lamps, low and high pressure sodium discharge lamps (low pressure sodium discharge lamps, high pressure sodium discharge lamps), induction lamps, light-emitting diodes (LED), light sources main parameters comparison), photobiological safety of lighting sources (Circadian cycle) and PV-LED systems.

The fifth chapter Solar energy and lighting in Serbia provides general information on (geographical position, climate in Serbia, solar radiation in Serbia, renewable energy policy in Serbia, solar energy research centers in Serbia, PV plants in Serbia), lighting in Serbia (early development of lighting, development of electric lighting, modern lighting (public lighting, street lighting, household lighting, lighting in the industry) and PV lighting).

The sixth chapter Solar energy and lighting in Bulgaria comprises general information on geographical position, climate in Bulgaria, solar radiation in Bulgaria, renewable energy policy in Bulgaria, solar energy research centers in Bulgaria, photovoltaic power plants in Bulgaria, lighting in Bulgaria (early development of lighting, development of electrical lighting, modern lighting (public lighting, street lighting, household lighting, industry lighting) and solar lighting).

The seventh chapter Solar energy and lighting in the Republic of Srpska contains general information on geographical position, climate in the Republic of Srpska, solar radiation in the Republic of Srpska, renewable energy policy in the Republic of Srpska, Banja

Luka and Academy of Sciences and Arts of the Republic of Srpska, solar energy laboratory, PV solar plants in the Republic of Srpska and lighting in the Republic of Srpska (early development of lighting, modern lighting).

Each chapter is followed by the list of references that can guide the reader and help him/her to better understand given subject matter.

This monograph is written in a clear and concise manner exhibiting extensive experience of the authors that they have attained in the area they are covering. Scientific contribution of the monograph is reflected in the successful presentation of the original scientific results obtained by the authors who were published in the international referred journals and presented in the international and national conferences in the area of the photovoltaic and lighting physics, technics and technologies. According to its contents and the number of the authors' citations this monograph represents a remarkable contribution to the area of the photovoltaic and lighting technologies and can be qualified as a distinguished monograph of the international significance.

This monograph can be useful to the physics, technical sciences and occupational safety students at the basic academic, master and doctoral studies, experts in the industry and wider in solving the problems in the area of the photovoltaic and lighting physics, technics and technologies generally and especially in Serbia, Bulgaria and the Republic of Srpska.

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