The effect of encapsulation layer on thermo-electrical parameters of photovoltaic panels

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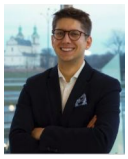
Abstract

Various materials are used as photovoltaic panels encapsulants, in the age of dynamic growing demand for green energy, each gained watt from photovoltaic panels is significant. The efficiency of most popular photovoltaics technologies are low and there are no cutting-edge technologies that are going to be widely in use in the close future. Due to increasing popularity of photovoltaic panels with high-level requirements, it is desirable to obtain the maximum power from the minimum surface. Especially when considering installation of photovoltaic panels on a vehicle or a different mobile platform, where there is a very limited area for photovoltaic modules. Thus each of photovoltaic panel component should be optimized. There were made a researches in field of improving performance of elastic and glass panels using various types and configurations of encapsulants. Following types of encapsulants were examined: various types of glass and silicones. The aim is to determine the best encapsulant material for each of three groups of products: high-end, low-cost and ultra durable solutions. Finding the appropriate solution required a complex and precise approach, involving many simulations and conducting series of tests to verify and judge those solutions before they are implemented in real life in a greater scale.

Recent Publications (minimum 5)

1. S. Nandy and R. Dev, "Theoretical analysis of in-built heat extraction mechanism to maintain electrical efficiency of a single solar cell (SSC) of glass-glass type photovoltaic (PV) Panel," 2014 1st International Conference on Non Conventional Energy (ICONCE 2014), Kalyani, 2014, pp. 19-23.
doi: 10.1109/ICONCE.2014.6808694
2. J. Govaerts et al., "Developing an Advanced Module for Back-Contact Solar Cells," in IEEE Transactions on Components, Packaging and Manufacturing Technology, vol. 1, no. 9, pp. 1319-1327, Sept. 2011.
doi: 10.1109/TCPMT.2011.2161082
3. J. P. Singh, S. Guo, I. M. Peters, A. G. Aberle and T. M. Walsh, "Comparison of Glass/Glass and Glass/Backsheet PV Modules Using Bifacial Silicon Solar Cells," in IEEE Journal of Photovoltaics, vol. 5, no. 3, pp. 783-791, May 2015.
doi: 10.1109/JPHOTOV.2015.2405756
4. J. M. Burst et al., "Performance of transparent conductors on flexible glass and plastic substrates for thin film photovoltaics," 2014 IEEE 40th Photovoltaic Specialist Conference (PVSC), Denver, CO, 2014, pp. 1589-1592.
doi: 10.1109/PVSC.2014.6925223
5. R. L. Smith, K. M. Stika, D. J. Walls and Y. Brun, "UV aging performance of Blue Light encapsulant films," 2013 IEEE 39th Photovoltaic Specialists Conference (PVSC), Tampa, FL, 2013, pp. 1600-1603.
doi: 10.1109/PVSC.2013.6744451

Biography



Wojciech Kapuścik - received M.Sc. degree in Mechanical Engineering from Academy of Science and Technology in Kraków, Poland. Except mechanical skills, he has a broad knowledge related to photovoltaic panels in terms of manufacturing and their operation. Wojciech also has a huge experience regarding 3D printing technologies. Member of AGH Solar Boat Team, where he is responsible for photovoltaics and design of boat components such as deck or steering system. Apart from AGH Solar Boat Team he is working as a lead product engineer in company providing smart city solutions.

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Maciej Borowicz - is an Electrical Engineering student at University of Science and Technology in Krakow. He was involved in designing and building three generations of AGH Solar Boat. Since 2018 the constructional section is held by Maciej.

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