

Materials and Technologies Utilized by the Thin-Film, Crystalline Silicon and Roll-to-Roll (R2R) Module Manufacturers (Presently and in the Future)

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Renewable energies such as Photovoltaic's (PV) do not produce green house gases, specifically carbon dioxide, and thus are known to have a positive effect on the climatic balance. Photovoltaics are simply semi-conductive devices which will produce electricity when exposed to light. In fact, the word "photovoltaic" means electricity from light.

The manufacturing of solar cells and photovoltaic grids has expanded dramatically in recent years. Photovoltaic production has been nearly doubling every two years – increasing by 30-45% each year since 2002 – making it one of the fastest growing energy technologies. Market information will be provided which depicts the outstanding growth as well as the trends occurring within the various technology types. With the global market for global cell production forecasted to reach 35GW in 2015, the thin film fraction is expected to grow from approximately 15% today, to 40% sometime in the 2017-2018 periods. In addition, the USA cell and module manufacturing is expected to grow at 50% through 2012. Discussion and information is provided which compares the technology areas, within thin film USA production, which represents the majority of the domestic manufacturing.

The demand in the USA is rapidly expanding due to falling system prices, stimulus funding and regulatory incentives. USA is poised for excellent growth as a primary global demand center. Information will be provided defining the drivers for the present and future growth; i.e., both domestically and internationally, as well as the forecasts as to future expectations.

In order to support this outstanding growth, unique and various material sciences will continue to be needed. This provides outstanding opportunities for the raw material manufacturers, converters and distributors. Busbars, C2S tapes, encapsulants, backfilm laminates, frontfilms, specialty barriers, specialty films and coatings, adhesives, sealants, edgetape, foamtapes, holding tapes, semi-conductive materials as well as many other products and technologies will be covered, along with a variety of module technologies.

Specifications for the completed module; i.e., IEC 61215, IEC 61646, and UL 1703, are considered “must” standards in order to sell product to the marketplace. Specific performance targets (minimum “antes”) are also expected for the raw materials, which comprise a solar module, and will be reviewed and compared with the available offerings. Opportunities for providing “value added” performance will also be covered along with developments occurring today as well as expected in the future.

Thin film (Cadmium Telluride-CdTe; Amorphous Silicon-a-Si; Copper Indium Gallium (Di) Selenide-CIGS), Crystalline Silicon (c-Si), Organic Photovoltaic (OPV), Dye Technology, Concentrated Photovoltaic (CPV) and Concentrated Solar Thermal (CST) define today’s major offerings for the photovoltaic and indirect solar thermal technologies. A high level overview of these systems as well as some of the advances and future growth forecasts have also been presented.

Finally, the future expectations have been reviewed, both along the lines of market growth as well as material science changes and advances. From specialty lenses and glazing technologies, to alternatives to the present day mainstays of module material components, a review of the unique and different developments have also been addressed.