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Title:

Borrowing Technology: Four million square meters of un-met need

Abstract:

Manufacturers of flexible thin film photovoltaic devices (FTFPV), need new standard products from the thin film display-dominated FTC producers. Additionally, dye-sensitized solar cells (DSSC) require catalytic platinum sites coated onto the FTC surface. FTC films show best performance in DSSC at around 15Ω/ based upon resistance and transmission considerations, while the best cost-performance is found to be approximately 30Ω/ . There is a growing need for advanced TFC materials developed specifically for the FTFPV market.

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EXTENDED ABSTRACT

Renewable energy solutions in response to the accelerating world energy demand are being met in a variety of ways. Photovoltic (PV) solutions have become increasingly viable as a significant contributor by providing distributed energy sources, particularly in regions where solar radiation is plentiful. However, PV pricing is variable and uncertain as the embodied energy of many conventional systems is still heavily dependant on petroleum sources and constrained resources. Additionally, many potential markets cannot be accessed by conventional PV technology due to weight and flexibility limitations especially within the personal mobile energy sector.

For the purpose of the current discussion, PV cell technology can be roughly divided into three major categories today, namely i) crystalline, ii) thin film and iii) "next generation" materials, the latter being the topic of this presentation; namely Dye-Sensitized Cells (DSC).

DSC, although rated on a standard basis at lower efficiency than many conventional technologies, is unique from in that it is a photo electrochemical cells very similar to photosynthesis, is inherently stable and may be tuned over a variety of light energies and intensities. It is also capable of being constructed in flexible formats, is also a thin film technology and thus may be packaged in mechanically flexible polymer materials. These features make it ideally suited for markets only available to flexible thin film photovoltaic devices (FTFPV) and otherwise all but inaccessible to traditional PV technologies. In addition, the variety of dyes available to this implementation of PV offers a range of colors spanning the visible and near i.r. spectrum.

Our company has constructed the first large commercial, roll-to-roll manufacturing facility in the world for DSC and is currently in production for select markets. However, due to the newness of this technology, appropriate supply chains are underdeveloped and as a consequence, many of the raw materials required for manufacturing product must developed *ab initio* or "borrowed" from existing but un-optimized product lines within complementary markets. Such is the case for FTFPV within the flexible transparent conductor (FTC) market.

FTC's possess many features which are not needed to meet FTFPV requirements and, in some cases, are actually contraindicated. For instance, FTFPV, while requiring maximum light transmission and minimum sheet resistance, does not have the same optical quality required for flexible display technology. However, most FTC material is built to high optical standards for high value added devices making these prohibitively expensive for flexible thin film PV.

In an attempt to rationalize the requirements for FTC in our product mix, current pricing structure is extrapolated to the best combination of sheet resistance and light transmittance. An optimum value, based upon certain known FTC technologies, suggests that the best performance index is based upon an nominal 30 ohm/square material. Our current production demand for this material is in excess of 4 million sq. m. of FTC for the first year alone. Conservative production increases for our FTF DSC PV technology are estimated to grow to around 2000% from of first year volume by the end of 2012 and thereafter continuing to grow at 25% per year. These growth projections are tailored to meet renewable energy cost targets of $0.10 / kWh. In order to meet this growing demand, new rationalized FTC architectures are needed to meet the peculiar requirements of FTFPV technology.