Structured Glass: More Efficiency, More Yield

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The international PV market keeps changing. There are constantly new claims about efficiency by reducing the sizes of modules (i.e. the space between the frame and the cells). True innovation is more and more seldom.

If one takes a look at a solar module, there are so many components: cells, string connectors, back sheet, frame and front glass. Only when all components work properly together, one can expect a top-product. Every little count. So does the front glass.

The German-Indian module producer Emmvee was the first company to utilise structured glass in order to truly increase the yield of their modules.

The distinctive feature of that glass, SGG Albarino P and G front glass by Saint-Gobain Solar Glass is the optimised surface pattern of the glass allows an increased light input into the module, resulting in an increase in yield of up to 4% per year.

The solar cells of Emmvee modules are covered with a hardened solar glass panel on the front. On the one hand, the front glass is to protect the module from environmental influences, above all UV radiation. On the other hand, it must be extremely transparent and designed in such a way that the modules optimally catch the light of the sun so that any radiation caught will not be released again, if possible. Emmvee realised the potential and became the first manufacturer to use the structured front.

How does it work?

The Mannheim based company Saint-Gobain Glass (SGG), one of the global market leaders and long-term partner of Emmvee, produces Securit® Albarino P and Securit® Albarino G glasses. The glass is deep extruded, extra white cast glass developed specially for photovoltaic modules. It has a low iron oxide content, providing especially favourable reflection characteristics. Albarino P front glass has a deep pyramidal pattern with the edges and corners blended. With Albarino G front glass, the pattern is wave shaped and rounded.

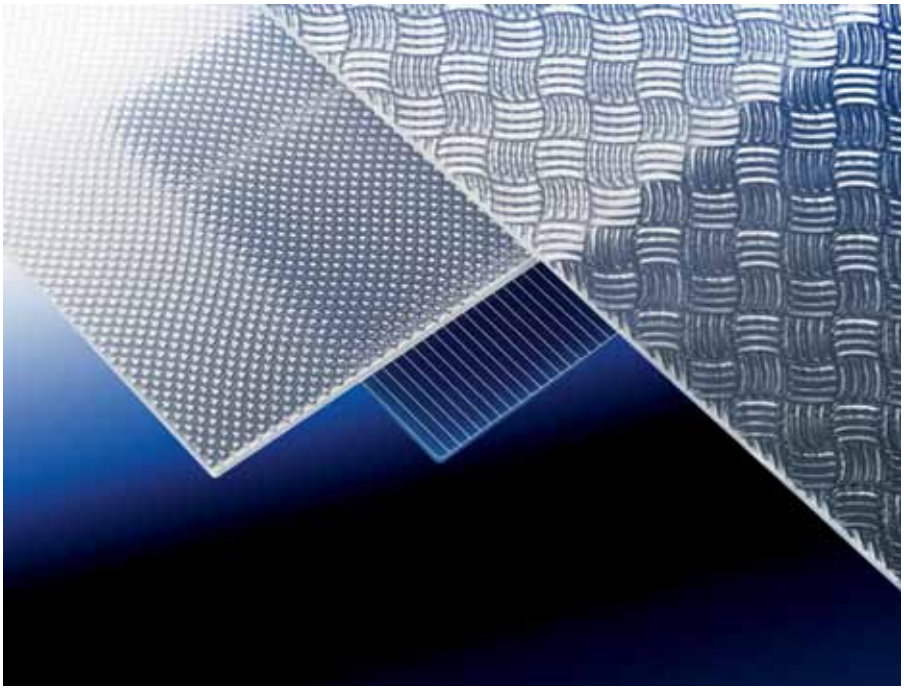
THE GERMAN-INDIAN MODULE PRODUCER EMMVEE WAS THE FIRST COMPANY TO UTILISE STRUCTURED GLASS IN ORDER TO TRULY INCREASE THE YIELD OF THEIR MODULES

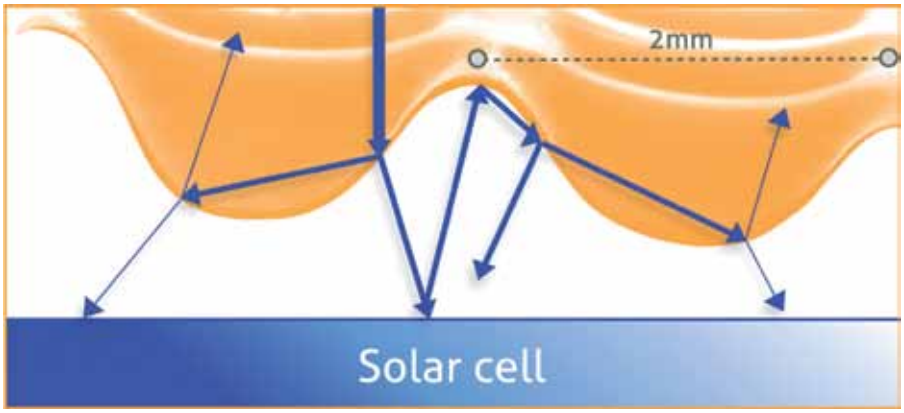
Both surface patterns act as light traps. Part of the radiation is reflected in such a way that it again impinges on the surface, i.e. part of the radiation which (with plain glass) is normally lost to the environment is reflected back onto the solar cell. This increases the radiation quantity incident on the cell and subsequently the energy yield.

One can simply see it for themselves: direct a laser pointer to Emmvee modules with structured glass and the beam will not be reflected out of the module. If one compares this with flat glass, the beam will, of course, be reflected out of the module. In Emmvee modules, the energy of the sun is used more than once!

Scientific research states an increase in energy yield thanks to energy transmission of three per cent annually compared with un-patterned glass. With an angle of incidence of 70 degrees to the normal line an increase in yield of as much as 10 % can be expected.

A study conducted by ISFH Institut für Solarenergieforschung Hameln (Institute for Solar Energy Research Hameln/Emmerthal, Germany) shows that with patterned front glass an increase in yield of four per cent can be expected as an annual average. Accordingly the efficiency gain of photovoltaic modules with specially patterned front glass over conventional plain front glass is highest in the morning and evening hours.





EMMVEE MODULES LEND THEMSELVES IDEALLY FOR ROOFS WITH LOWER ANGLES, BIPV AND ROOFS FACING SUB-OPTIMAL DIRECTIONS, SUCH AS NORTH-EAST

Cleaning

The edges and corners of the pattern are blended so that dirt and dust particles do not deposit but are flushed away by rain. On Albarino P glass the dirt particles gather in one place–the lowest point in the pyramidal depression and the major part of the surface remains free from contaminants. The optical properties are unchanged; however, the angle of installation should not be less than 10 degrees.

The accumulation of dirt particles is more easily discharged by wind or rain than e.g. a large number of small particles on plain glass. This is due with the fact that the flow velocity of rain water is higher around the blended pyramidal edges, similar to a lump of rock in a riverbed where the water flows around the sides more quickly. Modules with Albarino P and G glass require little maintenance also, the contact is considerably smaller than on flat glass.

Production

Cast glass can be produced with rather a small energy input, i.e. at low cost. Special rolls impart their pattern into the molten glass which flows from the melting end. As the rolls are cooled, the glass solidifies when passing the rolls and the glass surface retains the structure. A precisely adjusted online detector system recognises nickel sulphide inclusions from the production process even in patterned glass. This is important as such inclusions may result in glass fracture. Then the glass is cut, the edges machined and the glass hardened.

Use

Emmvee modules can be used for grid or off-grid installations. In MW plants in fields or on roofs. They lend themselves ideally for roofs with lower angles, BIPV and roofs facing sub-optimal directions, such as north-east. Since 2009, the use of structured glass has given the company a cutting edge in the market. At the end of the day, the combination of first-class components, mainly from Germany and the structured glass pays out with a higher efficiency and yield. There is a great number of Emmvee modules in international projects and academic research to prove the claim of the glass. Especially in saturated markets, it is important for companies to have that cutting edge, provided by the use of leading technology. The singular components, especially the glass, become economic factors; one should always bear in mind when planning a PV installation. This also gives Emmvee's partners at the point of sales a very competitive edge. The complete studies and references are available from Emmvee.