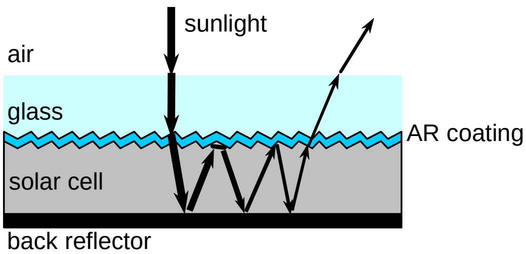
NON-CONFIDENTIAL DISCLOSURE

Texturing of glass for photovoltaic devices and modules

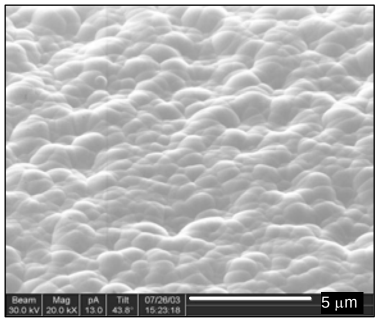
Background:

Solar cells need to be protected from the environment (rain, dust, etc) by means of a glass cover. This glass cover can interfere with the light entering the solar cell but if the glass surface that faces the solar cells is suitably textured (see graph), the sunlight travels obliquely through the solar cells, enabling a huge increase of the optical pathlength of the light in the solar cells due to a physical phenomenon called total internal reflection. As a result of this "light trapping" effect, the thickness of the solar cells can be enormously reduced (by a factor of up to 100!) without major loss in the photogenerated current. These materials savings lead to significantly reduced manufacturing cost for the solar modules. The light trapping effect is important for both silicon wafer solar cells and thin-film solar cells.



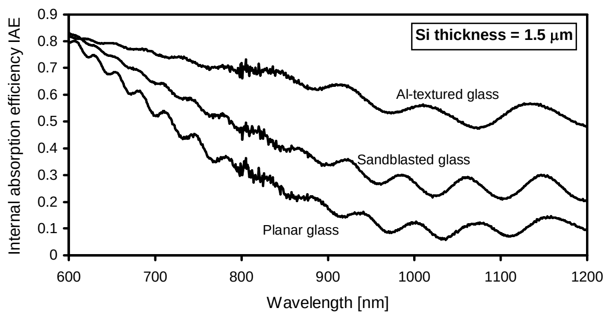
What is the technology?

The new method for texturing glass sheets is called AIT (Aluminium-Induced Texture). The AIT process consists of 3 steps: (i) Deposition of a thin Al film onto glass; (ii) annealing of the sample at 500-650°C for about 6 hours to allow Al to reduce SiO_2 at the interface; (iii) wet-chemical removal of the Al and the interfacial reaction products using two etches (first H_3PO_4, then a $HF:HNO_3$ mix). A key feature of the AIT process is the fact that the reaction between Al and SiO_2 is *spatially non-uniform* along the surface of the glass pane. The AIT process is very versatile and, by varying the $HF:HNO_3$ ratio, enables the realisation of a variety of glass textures, including textures with sub-micron feature sizes. Both mildly textured and heavily textured glass surfaces can be realised. A focused ion beam (FIB) microscope image of a polycrystalline silicon thin-film solar cell fabricated on an AIT-textured glass sheet is shown in the following figure. The texture has a feature size of about 1 micron, which is ideally suited for a range of thin-film solar cell materials.



Example for improved absorption of sunlight due to novel glass texture

Experimental proof for the superior absorption of sunlight due to the novel glass texture is shown in the graph below. For these experiments, 1.5 micron thick crystalline silicon films were fabricated on three types of glass surfaces (planar, sandblasted, AIT-textured) and their optical absorption measured over the wavelength range 600 to 1200 nm. As can be seen, compared to a planar glass, the Si film fabricated on AIT-textured glass absorbs long-wavelength light about 5 times more strongly. If a back surface reflector is added, the optical advantage becomes even larger.



Commercial Opportunity:

NewSouth Innovations is seeking partners who are interested in implementing this glass texturing method into their products.

Further Information:

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