TECHNOLOGY OF MANUFACTURING CRYSTAL SILICON BASED SOLAR PANELS

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Abstract: this article describes the technologies of making crystalline silicon-based solar panels, improving their chemical, mechanical, and thermal properties, as well as methods of using and connecting solar cells.

Key words: solar cells, current, voltage, thermal properties, sum of voltages.

0.6V voltage and 2A current produced by solar cells are not enough for consumption. In addition, solar cells cannot be used outdoors. Because it is mechanically very delicate. Solar cells are assembled in the form of solar panels to protect them from external influences and increase their total current and voltage [1-2].

In solar panels, solar cells are connected in parallel and in series. Cu metal tapes are widely used to connect them together. Its sizes are mainly of two types. To connect the first two solar cells together, 1.6-2 mm wide and 0.12-0.2 mm thick metal tapes are used, and the second is to connect each row of solar cells with each other, 5-6 mm wide and 0.2-0.3 mm thick metal tapes are used. Metal tapes are not only made of Cu, their surface is coated with Sn96.5/Ag3/Cu0.5 alloy salts to improve its chemical, mechanical and thermal properties [3-4].

When solar cells are connected in parallel, their voltage does not change, but the current increases (Figure 1).

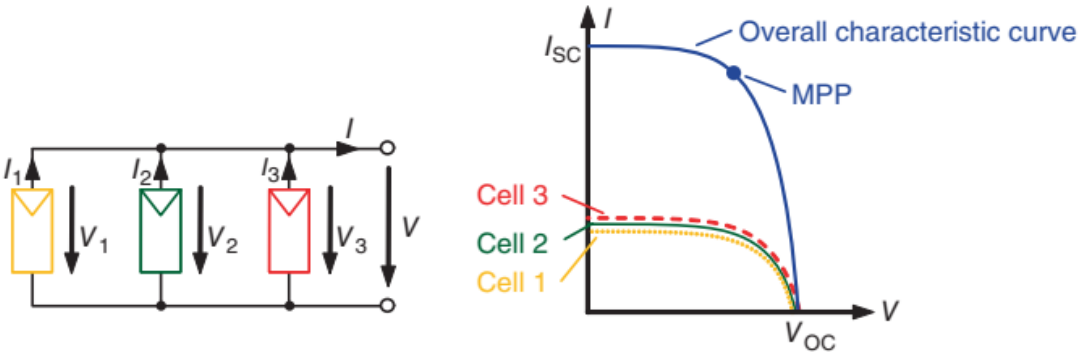

Figure 1. Parallel connection of solar cells

When solar cells are connected in series, the current does not change, and the voltage is the sum of the voltages of each solar cell (Figure 2).

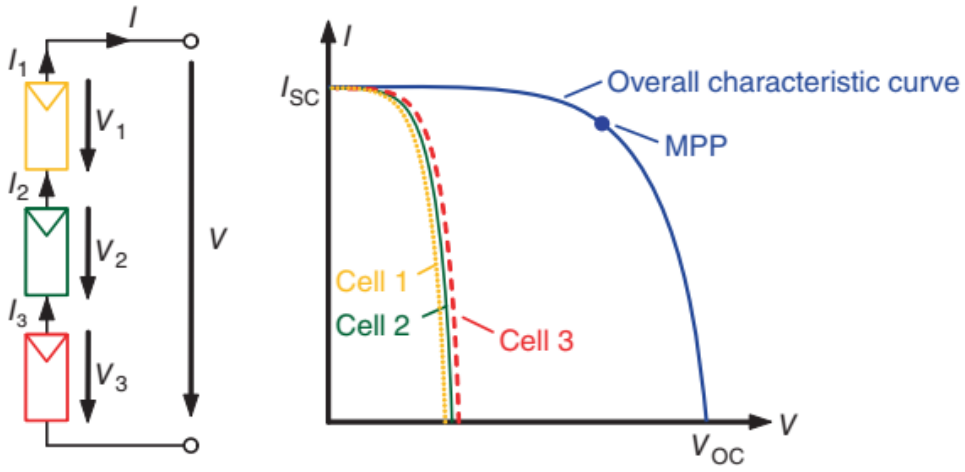

Figure 2. Series connection of solar cells

Modern solar panels consist of 36, 48, 60 or 72 solar cells. The next step is the encapsulation of the interconnected solar cells. EVA (Ethylene Vinyl Acetate) is used for encapsulation. The solar cell is sandwiched between two EVA films. And laminated at 1500C under pressure in vacuum through a laminating machine. One disadvantage of EVA film is that it is flexible, so it needs to be covered with an additional layer on top and bottom.EVA film protects the solar elements from moisture, dust and vibration. In addition, it ensures that the electric circuit created from solar cells does not break down. EVA layer is optically very transparent material. It transmits light very well.

The back of the solar panel is covered with an additional layer of PVF (Polyvinylfluoride). In addition to the EVA layer, the front part of the solar panels is covered with heated glass. Tempered glass is 6 times more resistant to mechanical stress than ordinary glass. Its surface is embossed. Because it is ensured that the light beam falling on its surface reaches the solar element perpendicularly.

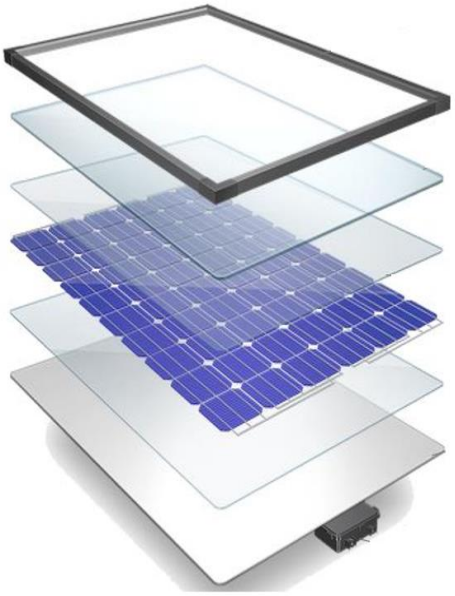

Figure 3. Layers of a solar panel

The edge parts of the solar panel are mainly framed using aluminum profiles. It facilitates installation and hardening of solar panels.

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