

AVA Solar: Cadmium telluride modules just like First Solar – only cheaper



The module looks like one of First Solar's products: same dimensions, same dark surface. But the manufacturer is AVA Solar Inc., a company founded just two years ago in Colorado, USA. The company has no lesser goal than producing cadmium-telluride (CdTe) modules cheaper than First Solar. There aren't any serially produced products yet, but if the company sticks to its plans, First Solar will soon have a competitor using CdTe technology.

There's a good reason why the company uses the same 60 × 120 cm glass format for its products as the CdTe market leader in Arizona: »The finance industry is conservative and this form factor was already established by First Solar,« says Julian Hawkins, VP for sales at AVA Solar.

Still, AVA's concept has allowed it to pull in a total of \$150 million of capital during its second round of financing in 2007 and 2008. The company plans to use those funds to build a 200 MW factory in Colorado. Production is scheduled to begin in early 2009; AVA intends to start deliveries in April at the latest.

The construction of this factory is based on 15 years of research. AVA Solar is a spin-off of Colorado State University. Pascal Noronha, head

▲ Pascal Noronha with a prototype from AVA Solar's factory floor. Production is scheduled to begin in early-2009.



▲ AVA Solar is located in Fort Collins, Colorado. The 200 MW factory will be built in the northern part of the state.

▲ Currently, AVA Solar isn't letting anyone into the production hall. Photographs distributed by the company don't give away any hints about production.

of the company, belongs to the team that developed the company's production process and is adapting it for commercial operations after five years of production in the laboratory. »We've designed the machines ourselves,« he says, »nobody can copy our process.« AVA has decided on a complete in-line process to prevent the raw module from making contact with atmospheric oxygen. But according to the company's concept, the entire production line stops in its tracks in the event problems arise at a single point along the line. One unusual production step is substrate encapsulation, which doesn't use conventional EVA foil. But Noronha is careful to guard the secret of how AVA encapsulates the modules. The completed modules come off the belt in two-minute intervals. With 12 machines in the factory, that corresponds to about 360 modules per hour. It takes about 2 hours for a module to pass from the first production step to delivery.

AVA expects its modules to reach an average efficiency of 10.5 percent by 2009; the first modules have shown efficiencies of »around 10 percent.« Within the next two years, the company hopes to achieve 12 percent and the long-term goal is 14 percent. First Solar currently offers an average efficiency of 10.1 percent.

It will be exciting to see what AVA's production costs will be. Noronha's goal is to build the first factory with production costs of less than \$1 per W, thereby undercutting its competitor in Arizona. And the product will be sold at market prices – that is, in line with First Solar's prices. »We have big plans,« says Noronha, »after our first factory is stable, we will be able to scale very quickly.«

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AVA Solar

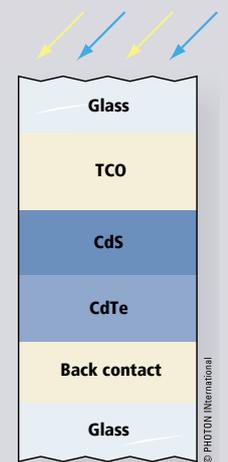
Founded: 2007

Location: Fort Collins, Colorado, USA

Technology: Cadmium telluride

AVA uses glass substrates that are already covered with a transparent conducting oxide (TCO). After initial cleaning, these substrates are moved to a vacuum deposition system. The glass substrates then move from station to station in two-minute intervals: after initial annealing, a 0.3 µm cadmium-sulfide layer followed by a 1.6 µm cadmium-telluride layer are deposited at temperatures of up to 700 °C. Since normal flat glass deforms at these temperatures, AVA uses more expensive tempered glass. A cadmium chloride post-treatment is applied in order to improve the material qualities of the semiconductor layer. The solar cell is finished depositing the back-contact layer by sputtering. The application of this layer is a company secret, something all CdTe module manufacturers guard closely. AVA's solar cells are separated in-situ by laser scribing. Finally, the monolithic PV module is encapsulated with a foil and a second glass plate.

Ava Solar
module structure



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Production equipment: Proprietary development

Efficiency: 10.5 percent (expected)

Costs: Less than \$1 per W (no date given)

Capacity 2008: Pilot line with 3 MW

Employees: 140

Expansion goal: 200 MW in 2009

Certification: IEC and UL (intended)

Finances: \$150 million in investment capital

»Second Solar« factor:

According to a recent study by PHOTON Consulting, there are currently 193 companies that produce, or are preparing to produce, thin-film modules. Only 11 of them have selected CdTe as their base material – even though First Solar's use of CdTe has propelled it triumphantly to market leadership. The main risk of using this material is the necessity of disposing cadmium-containing products, as well as the difficulty of estimating existing reserves of tellurium, an essential raw material. The company's founders and their many years of experience with the process speak in favor of AVA.

