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### Japan players bet big on emerging thin-film solar

While startups attract the clean tech venture capital millions in the US for new kinds of [thin-film solar technologies](#), some big established players in Japan are also putting significant money into major new efforts to move these emerging technologies into volume production in the next few years.

Mitsubishi Chemical Corp. is starting a big "Project PV," focusing on small-molecule organics solution coated on flexible substrates. Sanyo Electric Co. Ltd. is putting \$70M into microcrystalline thin-film technology at its new Advanced Photovoltaics Development Center. The directors of both projects recently briefed SST partner *Nikkei Microdevices* on the details.

Mitsubishi Chemical already sells some \$18M/year worth of materials to the solar industry, and figures this will grow to a \$90M business by 2010. But it sees a bigger opportunity in putting this materials expertise to work in making the cells itself -- targeting thin, light, flexible solar cells for portable applications that can be made cheaply with a roll-to-roll process. Right now there's little or no competition in this field from established product, and where required lifetimes are only in the more attainable 10-year range. "Solar cells are electronics with chemistry, so they're a natural market for a chemical company like us to target aggressively," said Mitsubishi Chemical PV Project director Tokitaro Hoshijima.

The company plans to use a coating of small molecule organics, which delivers better performance than the more solution-processed polymers. Hoshijima told *NMD* that Mitsubishi has developed a unique technology for a material that can be simply coated on and then heat-treated, without need for more costly vacuum deposition. It uses tetrabenzoporphyrin for the p-type semiconductor and a transparent conductive fullerene for the n-type, with efficiency currently of about 3.4%. Hoshijima says the company aims to sample a 7%-efficient product by 2010, and ultimately hopes to develop a tandem structure to perhaps double the efficiency. "Venture companies can't match the volume production capability of a major integrated chemical producer like Mitsubishi," he noted. Mitsubishi plans to produce the product in Japan, since the labor content in the continuous roll-to-roll process is minimal, and the rolls of product are light weight and easy to ship.

Who's the main competition? "Because roll-to-roll printing technology is necessary, our rivals will be not the current solar cell makers, but the big chemical and printing companies," said Hoshijima. "The main competition looks like it will not be from the US, but rather from China and India."

Long-time crystalline solar cell producer Sanyo, meanwhile, is pouring significant resources into moving up introduction of its microcrystalline thin-film solar cells, with the recent opening of a new Advanced Photovoltaics Development Center in its Gifu chip plant. Center director Makoto Tanaka noted the company is focusing on improved [microcrystalline silicon](#) material, for which it has developed a plasma deposition technology with what he says is 10x better throughput. The plan is to use the microcrystalline film in a tandem structure with an [amorphous silicon](#) layer.

"Our target date for volume production was 2012, but in order to move that up, we've decided to invest an additional \$14 million," said Tanaka, bringing total investment in the new center to some \$70M through 2010. He noted that the production ramp should be eased because part of the new process is very similar to that already used in Sanyo's mainstay heterojunction with intrinsic thin-layer (HIT) cells, which sandwich a single-crystal silicon substrate between layers of amorphous silicon thin films. The Gifu plant was the development site for Sanyo's now-discontinued OLED and low temperature poly Si TFT efforts, so its engineers also bring plenty of thin-film manufacturing experience to bear on the thin-film photovoltaics.

Sanyo's target is to reach 12% efficiency, surpassing other silicon thin films, and to cut module costs in half to \$1.40/W when the product is introduced, Tanaka told *NMD*. The real challenge going forward, though, he noted, is to match CdTe thin film on cost.

Sanyo will continue to target its high-efficiency HIT cells (up to 22% in the lab) on space-constrained applications such as roof panels, while aiming the lower cost but less efficient thin-film cells at locations where size is less of an issue. The existing Advanced Energy Laboratory develops the company's crystalline HIT cells separately in Kobe.

\* All yen converted at Y108/\$1.

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