

Cyrium outshines competition with photovoltaic cells that capture over 40% of the sun's total energy

After attracting \$18 million in venture capital, Ottawa-based Cyrium is using nanotechnology originally designed for space programs to increase the efficiency of solar panels

Fast facts

Corporate profile

With energy prices rising along with concerns about global warming, Ottawa-based Cyrium Technologies Inc. is using nanotechnology and photonic devices originally developed to power up satellites in space applications to advance the efficiency of solar cells that can produce more solar energy than conventional silicon panels for terrestrial use. Cyrium's cells can capture over 40% of the sun's total concentrated energy, opening the possibility to make modules with an overall efficiency in the 25-30% range whereas traditional silicon-based panels have an efficiency of typically 16-18%.

Why Ottawa

Cyrium is located at the R&D centre of Ottawa, the National Research Council (NRC). Calling the Montreal Road NRC campus home, Cyrium has arranged access to NRC's labs and equipment. Most importantly, Cyrium is able to work closely with scientists at the NRC's Canadian Photonics Fabrication Centre (CPFC). The CPFC works with start-ups and small to medium-sized companies and provides prototyping and production runs of photonic devices, including Cyrium solar cells.

Business advantage

Because of the high efficiency of Cyrium cells, solar modules based on those are also up to 50% smaller than other silicon solar solutions and require less infrastructure for their support, minimizing both costs and land requirements.

With energy prices rising along with concerns about global warming, Ottawa-based Cyrium Technologies Inc. is using nanotechnology and photonic devices originally developed to power up satellites in space applications to produce solar cells that can generate more energy than conventional silicon panels. Cyrium cells capture over 40% of the sun's total concentrated energy, allowing the possibility to make modules with an overall efficiency in the 25-30% range, whereas traditional silicon-based panels have an efficiency of typically 16-18%.



Canada's Innovation Capital

Founded in 2002, Cyrium's triple-junction solar cells have three sections that work together like a sieve. Piled on top of each other, each layer progressively captures light at different energies. This technology uses quantum materials to tailor the absorption and optimize the devices. The top layer captures ultraviolet light, the middle takes in visible light and the last one grabs any remaining light.

"Quantum dots are tiny nano-engineered crystals or materials with specific optical properties dictated by their size and shape," said Dr. Simon Fafard, founder and Chief Technology Officer of Cyrium. "By controlling their growth conditions, we can produce crystals that will absorb a particular segment of the solar spectrum."

Cyrium has the backing of four major venture capital firms. The Business Development Bank, Chrysalix Energy, Pangaea Ventures and the Quercus Trust have invested a total of \$18 million.

Dr. Fafard successfully filed for a patent for his technology in 2003 and today Cyrium is the only company in Canada pursuing this application of quantum dots.

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As a result of Cyrium being headquartered at the NRC, Cyrium does not have to invest large amounts of money into its own labs and equipment, allowing it to focus resources on bringing its products to market.

Leveraging its NRC location, Cyrium reaches out to other Ottawa-based government and post-secondary

institutions for research assistance. In July, 2008, Sustainable Development Technology Canada, an Ottawa-based federal agency that finances clean technologies, awarded \$5 million to a joint solar cell research project between Cyrium and the University of Ottawa.

Business advantage

According to Dr. Fafard, other triple-junction solar cell panels have middle layers that absorb too little of the solar spectrum, which limits the overall efficiency of the panel. Cyrium beats this concern by custom-tailoring quantum dots for the middle layer to capture an optimized range of light wavelength, increasing absorption. "By adding the quantum material we produce in controlled growth conditions, we can currently deliver more than 10% greater efficiency than today's best triple-junction devices. And, once optimized for photovoltaic concentrators (CPVs), our enhancement will bring our solar cells over 40% efficiency," said Dr. Fafard.

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Future growth plans

As research continues, Cyrium expects to evolve its core triple-junction technology to include silicon substrates and/or larger size wafers, achieving even lower price points for a given performance level and enabling expansion into new markets.

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