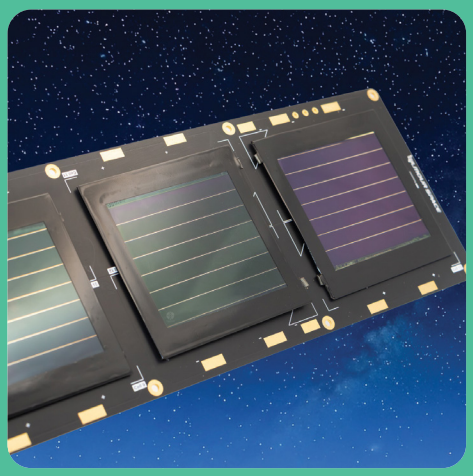
CASE STUDY

Halocell

Printing the next generation of solar panels in regional Australia



Halocell Space array
Image courtesy of Halocell

Printable semiconductor technology could open new opportunities for solar energy, space and advanced manufacturing.

The demand for renewable energy is surging. AI, data centres and everyday technology all need huge amounts of energy, and unstable oil prices are pushing countries to invest in alternative options. Solar energy is abundant, affordable and increasingly converted into usable power through new technologies.

Halocell, an industry-leading solar technology company based in Wagga Wagga, NSW, develops solar cells using a material called perovskite. Perovskite is a natural mineral that alone has limited uses; however, once combined with other materials, it becomes a semiconductor that is very good at turning sunlight into electricity.

The company mixes perovskite into special inks that can be printed in layers onto plastic. The layers are thinner than a human hair and can be "printed like banknotes or newspapers." Halocell said, "It's much quicker, requires less labour and is less energy intensive than manufacturing traditional silicon solar panels."

While most solar panels today rely on silicon, they are heavy, rigid and extremely condition-dependent. Additionally, their performance drops significantly on cloudy days or when the sun's angle isn't optimal.

Perovskite as a material can be adjusted to capture particular kinds of light. "You don't need the perfect temperature, you don't need the perfect angle, and you could even do it under cloudy conditions," Halocell said.

Halocell is starting with markets like space, where a lifespan of 3 to 5 years is sufficient. Gallium arsenide is the standard for satellite solar cells – efficient and radiation-resistant – but expensive, brittle, and made by few companies, putting it out of reach for most start-ups. Silicon is cheaper but degrades faster under radiation. Perovskite splits the difference, partially self-repairing its structure when disrupted, making it an attractive alternative.

Drones are another area of opportunity, especially in search and rescue, where flight time is critical. Battery swaps take 10 to 15 minutes – time rescuers can't spare. Calculations with a Halocell partner suggest perovskite wing panels and a lighter motor could stretch flight time from 2 to 6 hours.

Halocell, in collaboration with its university research partners, recently received a $19.2 million grant from the Australian Renewable Energy Agency to develop a see-through perovskite layer to place on top of existing silicon solar panels. The aim is to capture light that silicon misses, boosting the amount of energy collected without replacing the panel. This puts Halocell's technology alongside the industry's dominant product, rather than against it.

"We have proven the technology. We've proved the chemistry," said Halocell.

Its next investment round will pay for space testing, flight trials with satellite partners, and a transition from manual, labour-intensive manufacturing to a more automatic process in Wagga Wagga.

"It could be upscaled relatively quickly with the right equipment," the company said. This is the stage where investment counts most, because it turns a proven technology into a product.

Halocell said Australia is strong at research, but "there's nothing to get companies past the prototype stage into development and manufacturing."

By investing in advanced materials and manufacturing like Halocell, Australia can support growth in strategic sectors such as renewable energy and network infrastructure, while strengthening its position in the transition to net zero by 2050.

Image courtesy of Halocell