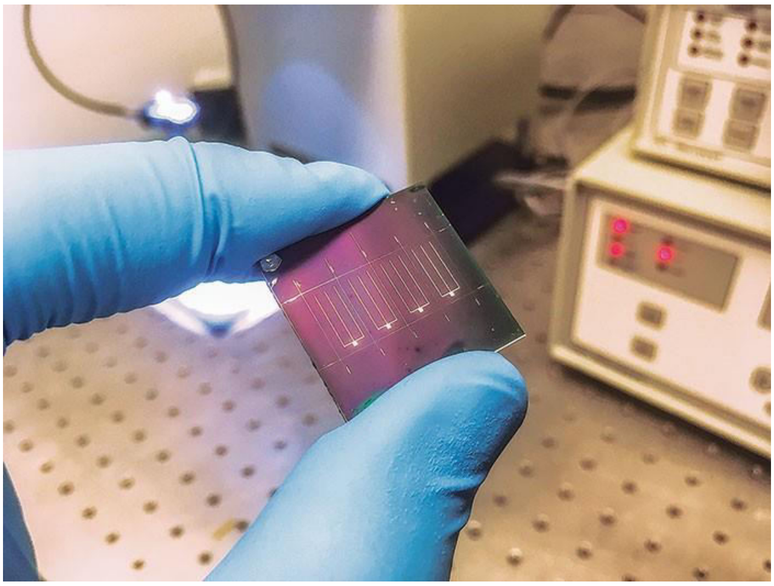
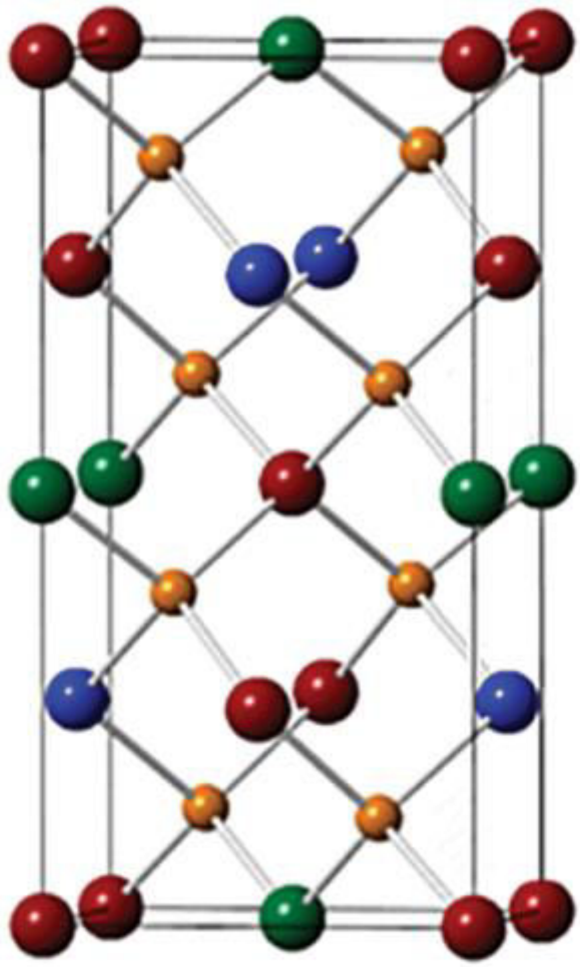
kersterite solar cells

Kesterite is a sulfide mineral with a formula $Cu_2SnS_4$. In its lattice structure, zinc and iron atoms share the same lattice sites. Kesterite is the Zn-rich variety whereas the Zn-poor form is called ferrokesterite or stannite. Owing to their similarity, kesterite is sometimes called isostannite.

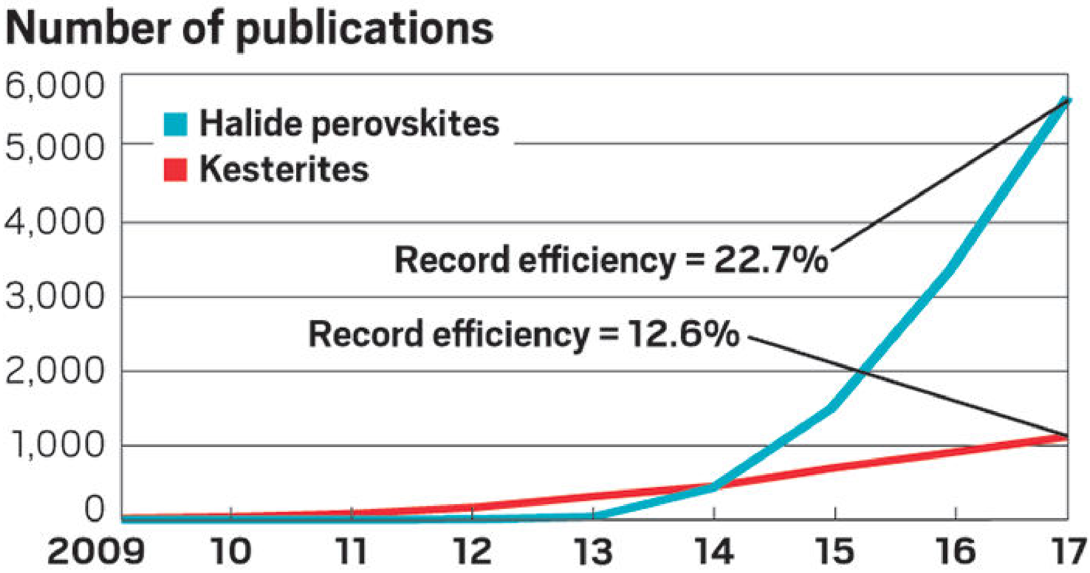




Countless rows of solar modules sit shimmering in the desert, a dark blue ocean stretching to the horizon. This is the Tengger Desert Solar Park in central China, by some estimates the world's largest photovoltaic array, capable of generating up to 1.5 gigawatts of power. No wonder it's been dubbed "the Great Wall of Solar Energy."

Arrays like this are a testament to the remarkable progress of solar photovoltaics (PVs). Global installed capacity is expected to top 400 GW this year—at least 40 times as high as a decade ago—and generate almost 2% of our electricity.

About 90% of these PV modules use the semiconductor silicon to absorb light and convert its energy into an electric current. Most are made in China, where manufacturers have leveraged government subsidies and economies of scale to drive down PV costs until they rival fossil-fuel sources. In a world facing dramatic climate change, the technology offers a glimmer of hope for the future.




Kesterites are not the only thin-film PV technology, of course. Cells made from cadmium telluride and copper indium gallium selenide (CIGS) have reached about 23% efficiency in the lab, and commercial module manufacturing is growing at a healthy rate. They offer clear environmental benefits because thin-film PV modules can "pay back" the energy needed to make them more quickly than bulky silicon cells can. Lightweight and potentially flexible, thin-film modules can also be integrated into buildings, an application for solar panels that is expected to grow rapidly in the coming years.

But cadmium is toxic, and tellurium and indium are relatively scarce. The manufacturing of CdTe and CIGS cells has geopolitical drawbacks, too: "For Europe to sustain production of these two technologies is quite complicated," Saucedo says. "Tellurium, indium, and gallium are mostly produced in other countries, sometimes unstable countries."

esterite is a greenish-black mineral that was first plucked from the ground in the 1950s by Russian mineralogists surveying the frozen badlands of Siberia. Fortunately, the synthetic kesterites in PV cells are easier to obtain. Researchers combine simple ingredients in solution and then spin coat the liquid onto a base. Heating it to a few hundred degrees Celsius, a process called annealing, creates a thin crystalline film that's roughly 1 µm thick.