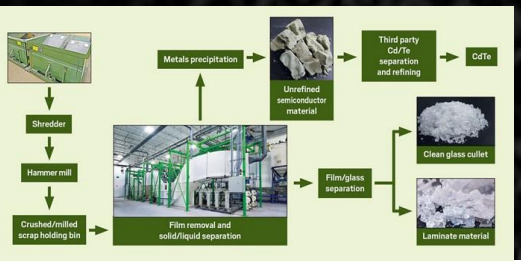

CdTe thin-film photovoltaics

Cadmium and tellurium form a stable semiconductor compound, CdTe, that is used in thin-film photovoltaic (PV) cells. CdTe PV cells are used in some of the world's largest photovoltaic solar facilities. They are the second most common PV technology in the world marketplace after crystalline silicon.

Benefits in brief

Thin-film PV technologies based on CdTe are used in the most energy- and eco-efficient solar panels currently available. They offer a combination of unmatched benefits:

Better energy return on investment

Thin-film PV technologies require much less energy during production and can generate more electricity than other PV technologies in real-world conditions. This leads to a faster Energy Payback Time (EPBT) and higher Energy Return on Energy Invested (EROI).

Smaller environmental footprint

Thanks to production technology that is highly resource and energy efficient, electricity produced using thin-film PV technologies has a lower environmental impact, on a lifecycle basis, than electricity generated with any other PV technology.

Proven recycling

For over a decade, thin-film PV module recycling technology has been operated at commercial scale to recover substrate materials and semiconductors for reuse in new thin-film PV panels and other products.

Lower costs

Thin-film PV achieves lower electricity production costs when compared with other PV technologies. This is because it uses integrated manufacturing technologies that are highly energy efficient, and it can generate more electricity than other PV technologies in real-world conditions.

High durability

With its monolithic design and direct deposition to substrates, thin-film PV is less prone to mechanical damage and *related performance losses, for example from hail.*

High efficiency potential

Thin-film PV technologies have the fastest innovation rate in the industry. The next cutting-edge step looks set to be tandem applications which will allow thin-film PV technologies to overcome conventional efficiency limitations, improve performance, and further decrease the cost of electricity generation.

90% recycling rate

Current thin-film PV module recycling processes recover more than 90% of a CdTe PV module at the end of its useful life for reuse in new solar, glass and rubber products. In addition to delivering competitive and reliable solar electricity globally, CdTe PV modules therefore provide an ecologically leading solution to climate change, energy security, water scarcity and the circular economy.

Recycling plants for CdTe PV modules are currently operational at a commercial scale in the United States, Germany, Malaysia, and Vietnam.

Safety track record

When bound to tellurium, cadmium is a strongly bonded semiconductor compound with a high melting point that is not soluble in water. It is called thin-film because the semiconductor is 33 times thinner than a human hair. CdTe is utilized in a double-glass PV module with encapsulant and edge sealant. As a result, over 30 GW of CdTe PV modules have been safely deployed throughout the world over the past two decades.

New applications in space

Researchers in the UK have developed a flexible thin-film CdTe solar cell for use in ultra-thin glass for space applications. The cell has been tested for more than three years on a satellite in low earth orbit.

More information

To discover more about thin-film photovoltaic technologies and other applications, check out the website of the International Cadmium Association. Address your specific questions to contact@cadmium.org.