

Perovskite Solar Cells

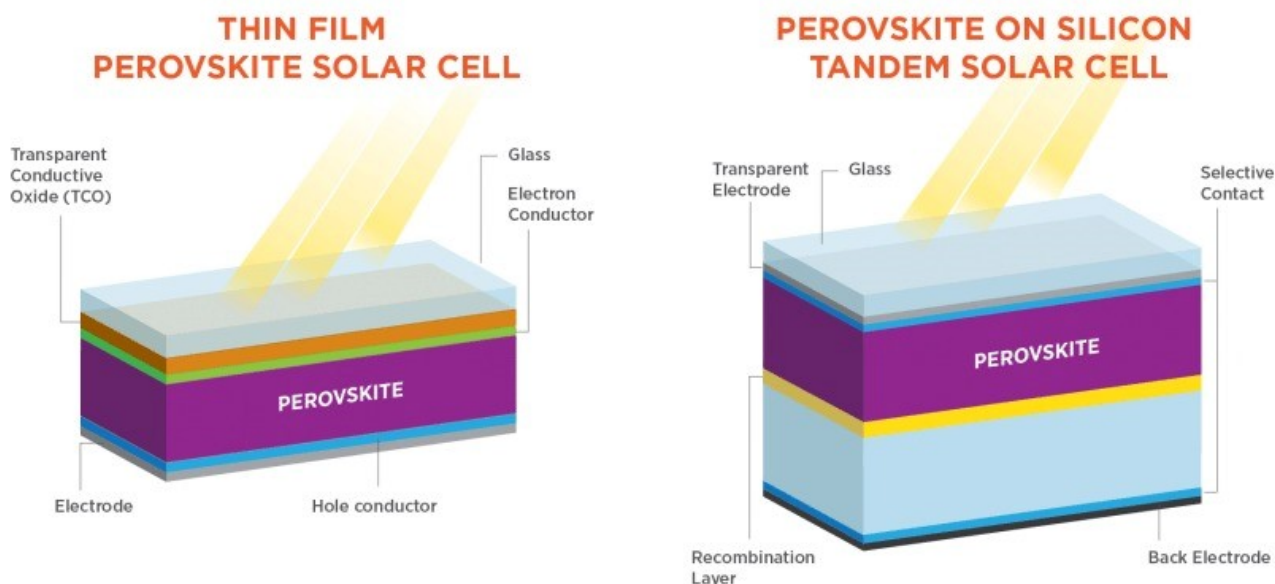
Prelims - Current events of national Importance | General Science.

Mains (GS III) - Science and Technology- developments and their applications and effects in everyday life.

Why in news?

Recently scientists have developed a water-based recycling solution for perovskite solar cells.

- **Perovskite solar cells** - A perovskite solar cell is a third-generation solar cell that employs a metal halide perovskite compound as a light absorber.
- Perovskite solar cells are made up of multiple layers.
- The perovskite layer can conduct and transport charges is sandwiched between metal electrodes and glass sheets.
- They are a class of semiconductor materials are known for their unique optical, superconductivity and electronic properties.



Metal halide perovskites (MHPs) were first discovered by Russian mineralogist L. A. Perovski.

- **Advantages** - They are cheaper to produce than silicon-based solar panels and offer higher efficiency in energy conversion.
- **Disadvantages** - But they contain toxic elements like lead that require careful disposal and have shorter lifespans than traditional solar panels.

- Perovskite materials are ***extremely unstable*** towards ambient (humidity and oxygen) conditions that restrict their commercialisation.
- **Recycling** - The components of the solar cells are recycled to minimize the emission and lower cost associated with solar energy generation.
- By recycling the components of a perovskite solar cell can be used for as long as possible, to minimise waste and promoting circular economy.
- Currently they are recycled using the ***toxic organic solvents***.

The new water-based recycling process

- Dissolving and recycling the lead-containing perovskite layer in water was a major challenge to overcome.
- For this, the scientists added three key salts to help in the recycling process.
- **Sodium acetate** -It binds with lead ions in solar cells to form ***lead acetate***, which is easily soluble in water.
- **Sodium iodide** - It helps in *repairing and restoring* degraded perovskite compounds.
- **Hypophosphorous acid** - It acts as a *long-term stabilizer*.

Stabilizer is a substance that either prevents or slows down reactions, thus enhancing the stability of a system.

- **Ethanol and ethyl acetate solutions** - They are also used to dissolve other components.
- **Results of the new method** - Scientists recovered approximately 99% of different layers after multiple recycling rounds.
- Recycled materials-maintained efficiency comparable to fresh materials even after five recycling cycles.

Quick facts

Carbon-based perovskite solar cells

- Indian scientists have indigenously developed highly stable, low-cost Carbon-based perovskite solar cells with superior thermal and moisture stability.
- The sensitivity of perovskite materials toward humidity and thermal stress is a major obstacle for practical implementation.
- Carbon-based perovskite solar cells (CPSCs) have been successful in minimizing device stability issues.
- It also reduces the fabrication costs.

Reference

[The Hindu| Perovskite Solar Cells](#)