

Germanium-based photovoltaic cells

What is a germanium solar cell?

Japanese scientists have developed a heterojunction germanium solar cell with the biggest area ever achieved for the tech. It has an open-circuit voltage of 291 mV, a short-circuit current of 45.0 mA/cm², and a fill factor of 0.656.

What are germanium photovoltaic cells used for?

At IMEC currently germanium photovoltaic cells are being developed for application in thermophotovoltaic (TPV) and hybrid lighting systems. Germanium cells are well suited for application in these systems, since the emitted spectra match the absorbance of germanium.

What is a germanium heterojunction solar cell?

It has an open-circuit voltage of 291 mV, a short-circuit current of 45.0 mA/cm², and a fill factor of 0.656. Researchers from Tokyo City University have fabricated a germanium (Ge) heterojunction solar cell with an area of 1 square centimeter, which they claim is the highest level ever reported for the technology thus far.

Are germanium substrates a good absorber material for solar cells?

The realm of solar cells has recognized germanium substrates as potent absorber material, exhibiting high efficiency. A typical thickness of 500 nanometers in the said substrates is known to significantly amplify the photocurrent generated by a single junction solar cell.

Why is germanium a key ingredient in high-efficiency solar cells?

The ingredient that is germanium plays a pivotal role in high-efficiency solar cells, attributable to its unique characteristics and harmonious relationship with other materials.

What makes germanium solar cells so effective?

The strategic amalgamation of other semiconductor substances like GaAs (Gallium Arsenide) onto the Ge base culminates in multiple junctions that synergistically elevate the overall efficacy of solar cells. Contrasting silicon-based brethren, germanium solar cells showcase reduced recombination frequencies courtesy of superior conductive traits.

rapidly evolving tin-based perovskite solar cells (PSCs). One powerful approach to enhance the performance of these PSCs is through compositional engineering techniques, specifically by incorporating a mixed cation system at the A-site and B-site structure of the tin perovskite. These approaches will pave the way for unlocking the full potential of tin-based PSCs. Therefore, in ...

The incorporation of germanium breathes new life into solar cell technology, offering several edges over traditional silicon-based photovoltaic systems. The conversion efficiency - a key yardstick in renewable energy production - can witness marked improvement with germanium-centric solar power frameworks.

Recent research indeed paints an ...

Stand-alone germanium solar cells, intended for application as bottom cell in mechanically stacked solar cells, have been realized applying an innovative process where the front contact ...

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Abstract--Multijunction solar cells with four junctions are expected to be the next-generation technology for both space and concentrator photovoltaic applications. Most commercial triple ...

In recent years, significant progress has been achieved in the field of perovskite solar cells (PSCs), particularly those comprised of organic-inorganic lead halides, resulting in a remarkable record efficiency of 25.20%. However, the persistent issue of lead toxicity poses a considerable barrier to their widespread commercial adoption. To address this ...

Focusing on the analysis of germanium-based thermophotovoltaic converters, Martín et al. propose a cost-efficient converter able to reach 23.2% efficiency with 1.34 W/cm² output power density. Moreover, the converters are production ready and strong candidates for introducing thermal battery technology in the market.

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In the present work, high efficient photovoltaic (PV) cells based on gallium antimonide have been developed and fabricated with the use of the liquid phase epitaxy (LPE) and diffusion from the gas phase techniques.

Abstract--Multijunction solar cells with four junctions are expected to be the next-generation technology for both space and concentrator photovoltaic applications. Most commercial triple-junction solar cells are today grown on germanium, which also forms the bottom subcell.

Germanium based photovoltaic cells have found applications in both space/satellite and terrestrial systems such as high-efficiency multi-junction concentrator solar cells. In these applications ...

The bandgap of Ge-based perovskite solar cells valued suitable for light harvesting and the halide of germanium was stable till 150 °C. Later in 2015, Krishnamoorthy and others synthesized lead-free germanium iodide perovskite materials, which showed great potential in the photovoltaic field. However, there was still a big gap between the efficiency of Ge-based ...

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At Fraunhofer Callab, both a germanium PV cell with an Al BSF and a germanium TPV cell on a lowly doped substrate with a highly reflective rear contact were ...

Germanium is an important material for today's highest efficiency solar cells with three np-junctions based on GaInP, GaInAs and Ge. The Ge subcell in these structures consists of a ...

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