Global Bipv Glass Market Forecast 2024-2032

Market Report | 2024-12-10 | 294 pages | Inkwood Research

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Report description:

KEY FINDINGS
As per Inkwood Research, the global BIPV glass market is expected to grow at a CAGR of 18.10% during the forecast period from 2024 to 2032. The market was valued at $4471.79 million in 2023 and is expected to reach $19989.56 million by 2032.
The market focuses on the integration of building-integrated photovoltaic (BIPV) materials into modern construction, combining both energy generation and architectural design. BIPV products, such as photovoltaic modules and BIPV solar modules, are increasingly being incorporated into buildings to generate solar power while maintaining aesthetic integrity.
These solar power-generating modules are critical in structures like zero-energy buildings, which are becoming more popular due to the rising demand for sustainable building materials and energy-efficient buildings. A central component of BIPV systems is BIPV glass, which integrates photovoltaic materials directly into windows, facades, and rooftops.
As the demand for building-integrated photovoltaic glass grows, many industries are seeking solutions to lower the carbon footprint of their buildings. BIPV installations are expected to play a key role in the shift towards the adoption of solar energy panels for clean energy solutions. According to a report by the United States Department of Energy, building-integrated photovoltaic systems have the potential to provide up to 50% of the US electricity supply.
Additionally, transparent BIPV glass modules help reduce lighting costs by allowing natural light into the building, further supporting energy efficiency. In Europe, recent policies are accelerating this trend; in December 2023, the EU established new energy efficiency targets aimed at decarbonizing the building sector. By 2026, the European Parliament aims to mandate solar installations on new commercial and residential buildings.
MARKET INSIGHTS
Key growth enablers of the global BIPV glass market:
- Supportive policies and tax incentives for green energy
- Increasing demand for energy-neutral structures
o The growing emphasis on energy-neutral structures is significantly influencing the demand for BIPV glass. Energy-neutral buildings, which generate as much energy as they consume, are becoming more prominent in the construction industry as sustainability goals and energy efficiency take priority. BIPV glass enables this shift by integrating photovoltaic technology directly into building materials, such as facades and windows, allowing buildings to produce renewable energy without compromising their design or functionality.
o This demand for energy-neutral structures is driven by the need to reduce carbon footprints and reliance on non-renewable

energy sources. Architects and developers are increasingly opting for materials like BIPV glass that contribute to energy-efficient designs. The ability of BIPV glass to combine power generation with aesthetic and functional features makes it an attractive option for constructing self-sufficient buildings.

o As urbanization and environmental concerns grow, the interest in energy-neutral buildings is likely to continue rising, positioning BIPV glass as a key material in supporting energy-efficient construction. The role of BIPV glass in facilitating the transition to energy-neutral structures is crucial in meeting both market demand and sustainability objectives.

Key growth restraining factors of the global BIPV glass market:

- High deployment expenses and limited efficiency of photovoltaic modules

o High deployment expenses and limited efficiency of photovoltaic modules are significant challenges for the BIPV glass market. The integration of photovoltaic modules into building materials requires specialized manufacturing processes and advanced installation techniques, which can significantly increase the initial costs. For many builders and developers, especially in cost-sensitive markets, this high upfront investment can be a major barrier to adoption.

o Additionally, the limited efficiency of photovoltaic modules in BIPV glass further impacts its widespread use. While BIPV technology has advanced over the years, the energy conversion efficiency of these modules is still generally lower compared to traditional standalone solar panels. This limitation means that larger surface areas may be required to generate the same amount of energy, making it less attractive for projects with limited space or those needing higher energy output.

- Challenging installation and integration slows BIPV adoption

Global BIPV Glass Market | Top Trends

A notable trend in the BIPV glass market is the rise of lightweight, flexible thin-film technology. Thin-film solar cells, unlike traditional crystalline silicon, are more adaptable to various architectural designs, including curved and irregular surfaces such as facades and non-standard roofs. This flexibility allows for greater integration into buildings without altering the original aesthetic vision.

The lighter weight of thin-film technology also reduces the structural burden on buildings, making installation easier and more suitable for projects where traditional solar panels may be impractical. Additionally, advancements are improving the energy capture capabilities of thin-film cells, making them a more efficient option for certain applications. While thin film generally offers lower energy conversion than crystalline silicon, its ability to blend seamlessly into complex designs makes it increasingly valuable for BIPV glass projects.

SEGMENTATION ANALYSIS

Market Segmentation - Material, Glazing Type, Component Type, and End Use -

Market by Material:

- Crystalline Silicon

o Crystalline silicon is a widely used material in the BIPV glass market due to its proven ability to convert sunlight into electricity. It is available in two main forms: monocrystalline and polycrystalline silicon.

- Monocrystalline silicon is made from a single continuous crystal structure, offering higher energy conversion efficiency, typically ranging from 18% to 22%. This makes it suitable for applications where maximizing energy output is important, though it comes with higher production costs.

- Polycrystalline silicon, on the other hand, is composed of multiple silicon crystals, resulting in lower efficiencies of around 15% to 17%. However, it is more cost-effective, making it a preferred choice for projects where budget considerations are a priority.

o Crystalline silicon is valued for its durability and reliability in BIPV glass applications, especially in exterior building surfaces like facades and rooftops. However, its rigidity and opacity present some design challenges, particularly in applications requiring transparency, such as windows. While semi-transparent crystalline silicon cells are being developed, they offer limited light transmission.

o Despite its benefits, crystalline silicon BIPV glass can face challenges such as limited flexibility in design and aesthetic considerations, as the material is typically opaque or semi-transparent.

- Amorphous Silicon

- Other Materials

Market by Glazing Type:

- Single Module
o Single module glazing refers to the use of a single layer of photovoltaic glass in building-integrated photovoltaic systems. This type of glazing is typically utilized in applications where simplicity, cost-effectiveness, and basic energy generation are key considerations. Single module glazing integrates photovoltaic cells into a single layer of glass, allowing for both energy production and serving as a building material, such as windows, facades, or rooftops.
o Single module systems are often chosen for projects where there is a need to balance the generation of solar energy with budget constraints. While they may not provide the same level of insulation or energy efficiency as multi-layered glazing options, they offer a practical solution for generating renewable energy in a variety of building applications.
o One of the main advantages of single module glazing is its relatively straightforward design, which can make installation easier and more cost-effective compared to more complex systems. This type of glazing is particularly suitable for projects that do not require advanced thermal insulation but still benefit from the integration of solar technology into the building?s structure.
- Double Module
Market by Component Type:
- BIPV Glass Roofs
- BIPV Glass Facades
- Other Component Types
Market by End Use
- Residential
- Commercial
- Industrial
- Other End Uses
REGIONAL ANALYSIS
Geographical Study based on Four Major Regions:
- North America: The United States and Canada
- Europe: The United Kingdom, Germany, France, Italy, Spain, the Netherlands, Belgium, Poland, and Rest of Europe
- Asia-Pacific: China, Japan, India, South Korea, Indonesia, Australia & New Zealand, and Rest of Asia-Pacific
o The BIPV glass market in Asia-Pacific is influenced by factors such as the rising demand for sustainable and energy-efficient buildings, along with the expansion of the building and construction industry. In recent years, the adoption of BIPV solar panels has increased within the construction sector, particularly in the design of energy-efficient structures. These panels contribute to environmental sustainability by reducing reliance on fossil fuels and enhancing building performance. Energy efficiency and renewable energy are critical in the region?s transition within the buildings sector, supporting the growing demand for BIPV glass.
o Additionally, the construction industry in Asia-Pacific is experiencing rapid growth due to increasing investments in both residential and commercial projects, as well as rising urbanization and population growth.
o This expansion positively influences the demand for BIPV glass across residential, commercial, and industrial applications. The region also hosts a variety of BIPV industry participants, including large manufacturers and smaller enterprises, who collaborate with construction firms and architects to deliver customized BIPV solutions that meet regional needs.
o Market participants in the region are focusing on strategies such as product innovation and investments in research and development. For example, in April 2022, a Japanese glass manufacturer introduced a building-integrated PV panel suitable for facades, curtain walls, and canopies. These panels, called SunJoule, offer flexibility in installation and can be tailored with monofacial or bifacial cells based on specific building requirements. Such innovations contribute to the ongoing development of the BIPV glass market in the Asia-Pacific.
- Rest of World: Latin America, the Middle East & Africa
Our market research reports offer an in-depth analysis of individual country-level market size and growth statistics. We cover the segmentation analysis, key growth factors, and macro-economic trends within the BIPV glass market, providing detailed insights into -
- United States BIPV Glass Market
- China BIPV Glass Market

- Germany BIPV Glass Market
COMPETITIVE INSIGHTS
The major players in the global BIPV glass market are:
- Sharp Corporation
- First Solar
- Nippon Sheet Glass Co Ltd
- Wuxi Suntech Power Co Ltd
- Taiyo Kogyo Corporation
Key strategies adopted by some of these companies:
- In March 2022, Canadian Solar launched the CS6R-MS module, part of the HiKu6 series, featuring 182 mm cells. Designed for residential, commercial, and industrial rooftops, this lightweight and compact module delivers up to 420 watts of power with an impressive efficiency of 21.5%, outperforming other PERC modules in its class. Available in various styles, it is certified under IEC 63126:2020 for high reliability and comes with a 25-year residential warranty. Also, the module is compatible with most PV inverters. Canadian Solar plans to introduce a more efficient CS6R module with HJT cells, aiming to enhance energy output and reduce the levelized cost of solar energy globally.
- In December 2023, AGC Inc announced the adoption of Sunjoule, a building-integrated photovoltaic glass for the roof of the bicycle parking lot at Shizuoka Station North Exit Square. TOKAI Cable Network Corporation installed this roof, facilitating the generation of solar power with a maximum output of 3.7 kW from Sunjoule.
- In July 2024, JinkoSolar partnered with RELC and Vision Industries to establish a joint venture in Saudi Arabia. This venture will build a high-efficiency solar cell and module manufacturing facility with a $1 billion investment. Expected to produce 10 GW annually of solar cells and modules, the project aims to advance Saudi Arabia?s renewable energy efforts and global competitiveness, integrating JinkoSolar?s advanced technology with local expertise.
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Frequently Asked Questions (FAQs):
- Where is BIPV glass typically used?
A: BIPV glass is used in windows, facades, skylights, canopies, and roofs in commercial and residential buildings.
- Can BIPV glass be transparent?
A: BIPV glass can be semi-transparent, offering various degrees of visibility while still generating solar power.
- Is BIPV glass customizable?
A: Yes, BIPV glass can be customized in terms of size, shape, color, and transparency to match architectural designs.

- Can BIPV glass be integrated with smart building systems?
A: Yes, BIPV glass can be connected to smart grids and IoT systems for real-time energy monitoring and optimization.

Table of Contents:

TABLE OF CONTENTS

Global Bipv Glass Market Forecast 2024-2032

Market Report | 2024-12-10 | 294 pages | Inkwood Research

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