

Nanocomposite Solar Cells Market Assessment, By Type [Organic, Inorganic], By Material Type [Cadmium Telluride, a-Si, Copper Indium Gallium Selenide Solar Cell, Others], By Application [Building Integrated PV, Fabric Integrated PV, Vehicle Integrated PV], By Region, Opportunities and Forecast, 2017-2031F

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Abstracts

Nanocomposite solar cells market is projected to witness a CAGR of 10.1% during the forecast period 2024-2031, growing from USD 4.05 billion in 2023 to USD 8.74 billion in 2031. Nanocomposite solar cells offer cost-effectiveness, enhanced efficacy, and much flexibility compared to traditional solar cells. Their unique composition incorporating nanomaterials enable improvised electron mobility and light absorption. Factors augmenting the overall market growth include significant technological advancements, a rise in demand for sustainable solutions, and various initiatives introduced by governments to promote renewable energy. Moreover, the scalability and potential for integration into various surfaces contribute to the market's growth, thereby fostering innovation in the field of solar energy.

The market has continuously been amplified since the advent of perovskite technology. Perovskite technology is a composite material used in nanocomposite solar cells that can produce more energy as compared to conventional silicon cells. Moreover, these are the fourth-generation solar cells that adequately meet the energy requirements and can be harvested with unique natures like eco-compatibility and low-cost fabrication.

For instance, in July 2023, the National Centre for Photovoltaic Research and Education (NCPRE) at the Indian Institute of Technology Bombay (IITB) developed a perovskite solar cell (PSC) that has demonstrated an efficiency of over 26%, which is most likely

the highest worldwide. The cell is a semi-transparent perovskite solar cell combined with a silicon-based solar cell.

Rise in Usage of BIPV is Augmenting the Market Growth

The rise in the adoption of BIPV is fueling the market expansion. BIPV's integration into the structure enhances the overall efficacy of nanocomposite solar cells. These cells adequately align with the evolving needs of sustainable construction, thereby becoming an idle choice for consumers.

For example, in September 2023, Japanese electronics manufacturer Panasonic unveiled its own building integrated photovoltaics (BIPV) glass product, which is the first to integrate perovskite solar cells with glass windows. Moreover, the development of new BIPV technologies is of particular interest in countries with limited geography for standalone solar projects or with limited roof space in urban areas. Moreover, Panasonic is entering this new sector with its own BIPV technology which integrates perovskite photovoltaics with glass.

The Surge in Usage of Cadmium telluride (CdTe) is Accelerating the Market Growth

The rise in usage of Cadmium Telluride (CdTe) is accelerating the growth of the nanocomposite solar cell market, as CdTe-based cells have emerged as the leading commercialized thin film photovoltaic technology. Moreover, CdTe solar cells offer myriad advantages over silicon-based cells, such as lower manufacturing costs, higher energy conversion efficiency, and better performance under low-light conditions. The increasing demand for renewable energy sources and continuous investments in R&D activities for enhancing the efficiency of CdTe thin film solar cells are also expediting the market growth.

For example, in March 2023, the United States Department of Energy stated that Cadmium Telluride (CdTe)-based cells are the leading commercialized thin film photovoltaic technology, with better temperature coefficients, energy yield, and degradation rates than Si technologies. More than 30 GW peak (GWp) of CdTe-based modules are installed worldwide, with multiple companies in production, modules shipping at up to 18.6% efficiency, and lab cell efficiency above 22%.

The Emergence of Nanotechnology is Catering to Myriad Opportunities

The emergence of nanotechnology is creating numerous opportunities for the

nanocomposite solar cell market. The increasing demand for efficient and sustainable energy solutions, coupled with the integration of smart technology in solar panels, is driving market growth. The adoption of renewable energy sources and the availability of research funding and private investments are crucial for advancing the technology and bringing it closer to commercialization. The market is primarily in the research and development phase, but it is anticipated to prosper exponentially in the future.

For example, in March 2023, Phys.org, delineated that Materials as tiny as 1.2. nm can function in solar cells which have the capability to harvest the sun's energy. Carbon nanotubes, which are tiny tubules made of carbon atoms, serve as templates for the inorganic halide compounds. The identification of these minuscule nanowires may lead to novel features and uses for this kind of renewable energy.

Asia-Pacific Emerged as the Market Leader Throughout the Prevised Timeframe

The Asia-Pacific region emerged as the market's most dominant region for several reasons. Robust economic growth, continuous rise in energy demand, and a sheer commitment to sustainable development have amplified the region's focus on renewable energies. Moreover, government incentives, coupled with the rise in investment in R&D activities, are further amplifying the market growth of the region.

In August 2023, South Korean researchers created an innovative building-integrated photovoltaic (BIPV) solar cell that utilizes a distributed bragg reflector (DBR) electrode to improve light scattering and meet aesthetic standards. The DBR electrode consists of alternating dielectric layers, acting as reflectors and dielectric mirrors, with a multilayered composition alternating between high and low refractive indices, allowing for customizable reflection spectra.

Government Initiatives

Government initiatives are crucial for driving the adoption of nanocomposite solar cells and other renewable energy technologies. Subsidies, tax incentives, and feed-in tariffs encourage consumers and businesses to invest in solar energy. Moreover, in the current market scenario, the government is sheerly focusing on increasing its investments in the solar sector to support technological advancements of nanocomposite solar cells.

For instance, in March 2023, the Government of India (GoI), under its Production Linked Incentive Scheme for high-efficiency solar PV modules (Tranche-II), decided to allocate

a total capacity of 39,600 MW of domestic solar PV module manufacturing capacity to 11 companies, with a total outlay of approximately USD 1.67 billion. Moreover, it is expected that a manufacturing capacity of 7,400 MW will become operational by October 2024, 16,800 MW capacity by April 2025, and a balance of 15,400 MW capacity by April 2026. The Tranche-II is anticipated to bring in an investment of nearly USD 11.16 billion.

Key Players Landscape and Outlook

Major companies are investing heavily in BIPV applications, driving rapid advancements in the nanocomposite solar cell industry. This trend is evident in the development of hybrid solar power inverters, which combine efficiency with innovation to meet the evolving demands of homeowners globally. The nanocomposite solar cell market is primarily in the research and development phase, but it holds immense promise due to its potential to significantly increase the efficiency of solar energy conversion. The increasing demand for efficient and sustainable energy solutions, coupled with the integration of smart technology in solar panels, is driving market growth.

In August 2023, UbiQD, a nanotechnology company based in New Mexico, entered a joint development agreement with First Solar. The purpose of the collaboration was to incorporate fluorescent quantum dot technology in advanced solar modules while exploring its additional benefits. Quantum dots (QD) are photoluminescent particles that are so small that it would take 100,000 of them to span one fingernail.

Contents

1. RESEARCH METHODOLOGY

2. PROJECT SCOPE & DEFINITIONS

3. EXECUTIVE SUMMARY

4. VOICE OF CUSTOMER

4.1. Factors Considered in Purchase Decisions

- 4.1.1. Efficiency
- 4.1.2. Cost
- 4.1.3. Durability and Lifespan
- 4.1.4. Technology Advancements
- 4.1.5. Aesthetics and Design
- 4.1.6. Environmental Impact
- 4.1.7. Installation and Maintenance Requirements
- 4.1.8. Warranty and After-Sales Support

5. NANOCOMPOSITE SOLAR CELLS MARKET OUTLOOK, 2017-2031F

5.1. Market Size & Forecast

- 5.1.1. By Value

5.2. By Type

- 5.2.1. Organic
- 5.2.2. Inorganic

5.3. By Material Type

- 5.3.1. Cadmium telluride (CdTe)
- 5.3.2. a-Si
- 5.3.3. Copper indium gallium selenide solar cell (CI(G)S)
- 5.3.4. Others

5.4. By Application

- 5.4.1. Building Integrated PV (BIPV)
- 5.4.2. Fabric Integrated PV (FIPV)
- 5.4.3. Vehicle Integrated PV (VIPV)

5.5. By Region

- 5.5.1. North America
- 5.5.2. Asia-Pacific

- 5.5.3. Europe
- 5.5.4. South America
- 5.5.5. Middle East and Africa
- 5.6. By Company Market Share (%), 2023

6. NANOCOMPOSITE SOLAR CELLS MARKET OUTLOOK, BY REGION, 2017-2031F

- 6.1. North America*
 - 6.1.1. Market Size & Forecast
 - 6.1.1.1. By Value
 - 6.1.2. By Type
 - 6.1.2.1. Organic
 - 6.1.2.2. Inorganic
 - 6.1.3. By Material Type
 - 6.1.3.1. Cadmium telluride (CdTe)
 - 6.1.3.2. a-Si
 - 6.1.3.3. Copper indium gallium selenide solar cell (CI(G)S)
 - 6.1.3.4. Others
 - 6.1.4. By Application
 - 6.1.4.1. Building Integrated PV (BIPV)
 - 6.1.4.2. Fabric Integrated PV (FIPV)
 - 6.1.4.3. Vehicle Integrated PV (VIPV)
 - 6.1.5. United States*
 - 6.1.5.1. Market Size & Forecast
 - 6.1.5.1.1. By Value
 - 6.1.5.2. By Type
 - 6.1.5.2.1. Organic
 - 6.1.5.2.2. Inorganic
 - 6.1.5.3. By Material Type
 - 6.1.5.3.1. Cadmium telluride (CdTe)
 - 6.1.5.3.2. a-Si
 - 6.1.5.3.3. Copper indium gallium selenide solar cell (CI(G)S)
 - 6.1.5.3.4. Others
 - 6.1.5.4. By Application
 - 6.1.5.4.1. Building Integrated PV (BIPV)
 - 6.1.5.4.2. Fabric Integrated PV (FIPV)
 - 6.1.5.4.3. Vehicle Integrated PV (VIPV)
 - 6.1.6. Canada

6.1.7. Mexico

*All segments will be provided for all regions and countries covered

6.2. Europe

6.2.1. Germany

6.2.2. France

6.2.3. Italy

6.2.4. United Kingdom

6.2.5. Russia

6.2.6. Netherlands

6.2.7. Spain

6.2.8. Turkey

6.2.9. Poland

6.3. South America

6.3.1. Brazil

6.3.2. Argentina

6.4. Asia-Pacific

6.4.1. India

6.4.2. China

6.4.3. Japan

6.4.4. Australia

6.4.5. Vietnam

6.4.6. South Korea

6.4.7. Indonesia

6.4.8. Philippines

6.5. Middle East & Africa

6.5.1. Saudi Arabia

6.5.2. UAE

6.5.3. South Africa

7. MARKET MAPPING, 2023

7.1. By Type

7.2. By Material Type

7.3. By Application

7.4. By Region

8. MACRO ENVIRONMENT AND INDUSTRY STRUCTURE

8.1. Supply Demand Analysis

- 8.2. Import Export Analysis
- 8.3. Value Chain Analysis
- 8.4. PESTEL Analysis
 - 8.4.1. Political Factors
 - 8.4.2. Economic System
 - 8.4.3. Social Implications
 - 8.4.4. Technological Advancements
 - 8.4.5. Environmental Impacts
 - 8.4.6. Legal Compliances and Regulatory Policies (Statutory Bodies Included)
- 8.5. Porter's Five Forces Analysis
 - 8.5.1. Supplier Power
 - 8.5.2. Buyer Power
 - 8.5.3. Substitution Threat
 - 8.5.4. Threat from New Entrant
 - 8.5.5. Competitive Rivalry

9. MARKET DYNAMICS

- 9.1. Growth Drivers
- 9.2. Growth Inhibitors (Challenges and Restraints)

10. KEY PLAYERS LANDSCAPE

- 10.1. Competition Matrix of Top Five Market Leaders
- 10.2. Market Revenue Analysis of Top Five Market Leaders (in %, 2023)
- 10.3. Mergers and Acquisitions/Joint Ventures (If Applicable)
- 10.4. SWOT Analysis (For Five Market Players)
- 10.5. Patent Analysis (If Applicable)

11. PRICING ANALYSIS

12. CASE STUDIES

13. KEY PLAYERS OUTLOOK

- 13.1. Waaree Group
 - 13.1.1.1. Company Details
 - 13.1.1.2. Key Management Personnel
 - 13.1.1.3. Products & Services

13.1.1.4. Financials (As reported)

13.1.1.5. Key Market Focus & Geographical Presence

13.1.1.6. Recent Developments

13.2. Nanosolar

13.3. First Solar

13.4. Antec Solar GmbH

13.5. SoloPower Systems Inc.

13.6. Toledo Solar Inc.

13.7. Solar Frontier Europe GmbH

13.8. Abengoa

13.9. Ascent Solar Technologies

13.10. Hanergy Thin Film Power Group

*Companies mentioned above DO NOT hold any order as per market share and can be changed as per information available during research work.

14. STRATEGIC RECOMMENDATIONS

15. ABOUT US & DISCLAIMER

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