Quantum Dots (QD) - Market Share Analysis, Industry Trends & Statistics, Growth Forecasts (2025 - 2030)

Market Report | 2025-04-28 | 100 pages | Mordor Intelligence

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Report description:

The Quantum Dots Market size is estimated at USD 6.49 billion in 2025, and is expected to reach USD 14.48 billion by 2030, at a CAGR of 17.4% during the forecast period (2025-2030).

Key Highlights
- Quantum dots are nanoscale semiconductor particles that exhibit quantum mechanical properties. These tiny structures, typically composed of materials like cadmium selenide, can absorb and emit light at specific wavelengths, making them valuable for applications in electronics, medical imaging, and displays. Their size-dependent electronic characteristics allow precise control over their optical and electronic properties.
- Quantum dots exhibit unique optical properties, such as size-dependent fluorescence and the ability to emit specific wavelengths of light. This makes them valuable in applications like displays and lighting, where precise color control is essential. In addition, the unique composition, tunable property, and size of these semiconducting quantum dots make them highly appealing for a wide variety of applications and new technologies.
- In agriculture, it is possible to create light-converting coatings, which are anticipated to increase yield and the speed of maturation of fruit plants in greenhouses. Dutch farmers are increasingly adopting indoor farming, and they can cultivate more crops faster and in a smaller space with advanced greenhouses using LED lights.
- Quantum dot (QD) assisted displays are among the newest technology additions. The adoption is anticipated to grow due to their ability to produce more vivid colors and bring flexibility to modern displays. The unique size-dependent optical, electronic, chemical, and optoelectronic features of QDs make them highly suitable for modern displays owing to their higher power efficiency and wide color gamut with lower barrier protection requirements.
- However, the high costs of lighting solutions have restricted the growth of quantum dot technology to be used only in high-end applications. They are unable to compete with other cheaper technologies, like LEDs. Additionally, technical limitations such as

lower contrast ratio and poor viewing angle in comparison to OLEDs also continue to challenge the studied market's growth.

Quantum Dots (QD) Market Trends

Optoelectronics and Optical Components to Witness Significant Growth

- Quantum dot displays have emerged as a promising alternative to traditional liquid crystal displays (LCDs). By incorporating QDs as color-converting materials, these displays can achieve a wider color gamut, enhanced brightness, and improved energy efficiency. Quantum dot-enhanced LCDs deliver vibrant and more accurate colors, making them suitable for high-quality imaging in televisions, monitors, and mobile devices.
- Quantum dots have also revolutionized the lighting field, mainly in developing next-generation light-emitting diodes (LEDs). By utilizing QDs as down-converters, white LEDs can achieve higher color rendering index (CRI) values and better color quality. Quantum dot LEDs offer a wider range of colors, improved efficiency, and longer lifetimes than conventional phosphor-based LEDs. These advancements have paved the way for energy-efficient lighting solutions in homes, offices, and urban environments.
- LEDs also form a crucial part of the optical fiber communication systems for transmitting data through modulated light; according to IEA, the penetration rate of LEDs into the international lighting market is rising considerably; it is expected to reach 76% by 2025 and 87.4% by 2030, and these LEDs are also telecommunication lasers, vital in transmitting information through optical communication systems.
- Nanometer-scale semiconductor devices have been predicted as next-generation technologies with high integration and functionality. Quantum dots exhibit unique properties due to their quantum confinement. These unique properties have brought to light the potential of quantum dots in optoelectronic applications. Numerous efforts have been dedicated to these favorable nanomaterials for next-generation optoelectronic components, such as lasers, LEDs, photodetectors, amplifiers, and solar cells, highlighting enhancing performance and functionality.

Asia-Pacific is Expected to Hold Significant Market Share

- China's investments in semiconductor manufacturing and quantum computing research offer potential growth opportunities for quantum dots. Quantum dots have the potential to advance semiconductor technologies and contribute to the development of quantum computers.
- China has made huge advances in quantum technologies, particularly in quantum communication. Vachana is behind the United States in some aspects of quantum computing. Its scientists have made eye-catching achievements and are progressing rapidly. In recent years, there have been reports of advancements in quantum radar and quantum sensors, showcasing China's commitment to quantum technology.
- The growth of quantum dots in Japan has been driven by significant advancements in quantum dot technology and its application. For instance, researchers at the Photonic Network Research Institute of Japan's National Institute of Information and Communication Technology have developed a new light source technology using high-quality quantum dots. These quantum dots exhibit higher stability and optical frequency than those created using conventional methods, paving the way for potential application in various fields.
- Japan's NITC completes research that could allow fiber optics networks to use quantum dots in new areas of the spectrum. Researchers have successfully transmitted optical data in an untapped frequency band by applying a new approach to quantum dot growth, showing the potential to expand fiber optic network capabilities.

Quantum Dots (QD) Market Overview

The quantum dots market is semi-consolidated and has an increasing number of applications, and the level of market penetration is expected to grow during the forecast period. Major vendors have a global presence, which helps them to gain a substantial market share. Key players in the market include Nanosys Inc. (Shoei Electronic Materials Inc.), NnCrystal US Corporation (NN-Labs), Quantum Materials Corporation, UbiQD Inc., Ocean NanoTech., etc. The businesses are leveraging strategic collaborative actions to improve their market percentage and enhance profitability.

- February 2024 - Quantum Solutions announced the booming demonstration of wafer-level deposition of QDot PbS quantum dot n-type ink on a 200 mm silicon ROIC (read-out integrated circuit) wafer. This groundbreaking work highlights the feasibility of producing SWIR (short-wave infrared) image sensors with high throughput on 200 mm wafer platforms, which is essential for large-scale manufacturing of sensors.

- November 2023 - Nanoco Group has signed a new two-year joint development agreement (JDA) with its existing major Asian chemical partner to optimize and scale up the production of Nanoco's second-generation quantum dot materials for infrared sensing applications. This marks the company's latest milestone in becoming a commercial provider of nanomaterials to the sensing market and supports its FY24 forecasts.

Additional Benefits:

- The market estimate (ME) sheet in Excel format
- 3 months of analyst support

Table of Contents:

Quantum Dots (QD) - Market Share Analysis, Industry Trends & Statistics, Growth Forecasts (2025 - 2030)

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