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Phase Change Materials (PCM) Market Forecasts to 2032 – Global Analysis By Form (Encapsulated PCM, Non-encapsulated PCM and Shape-stabilized PCM), Material, Temperature Range, Technology, End User and By Geography

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Abstracts

According to Stratistics MRC, the Global Phase Change Materials (PCM) Market is accounted for $2.6 billion in 2025 and is expected to reach $7.4 billion by 2032 growing at a CAGR of 15.8% during the forecast period. Phase change materials (PCMs) are substances that absorb, store, and release large amounts of latent heat during phase transitions, typically between solid and liquid states. Common PCMs include paraffins, fatty acids, salt hydrates, and certain polymers. They are used in thermal energy storage, building insulation, textiles, and electronics cooling. By stabilizing temperature fluctuations, PCMs improve energy efficiency and user comfort. Their ability to maintain near-constant temperatures during heat exchange makes them important tools in sustainable energy management.

According to NASA research, PCMs are critical in astronaut suits and spacecraft systems to regulate temperature by absorbing and releasing thermal energy during melting and freezing.

Market Dynamics:

Driver:

Expansion of green building initiatives

The PCM market is strongly driven by the rapid expansion of green building initiatives

worldwide, with growing demand for energy-efficient construction materials. Governments, regulatory bodies, and private developers are emphasizing sustainable infrastructure to reduce carbon footprints. PCMs help regulate indoor temperatures by storing and releasing heat, reducing HVAC energy consumption. Their integration into walls, floors, and roofs aligns with LEED and BREEAM certifications. Consequently, rising green construction projects are fueling large-scale adoption of PCMs across residential, commercial, and industrial applications.

Restraint:

High cost of advanced PCM formulations

A key restraint in the PCM market is the high cost associated with advanced formulations. Producing encapsulated and bio-based PCMs requires expensive raw materials, specialized encapsulation technology, and complex manufacturing processes. These factors elevate product pricing, restricting affordability for small-scale construction projects and cost-sensitive industries. While PCMs offer long-term energy savings, the high initial investment can deter adoption. Additionally, limited large-scale manufacturing capacity increases costs further, slowing down widespread commercialization despite strong sustainability benefits.

Opportunity:

Innovation in bio-based and eco-friendly PCMs

Significant opportunities exist in the development of bio-based and eco-friendly PCMs that align with the global shift toward sustainable materials. Derived from renewable feedstocks such as plant oils and fatty acids, these PCMs offer lower toxicity and reduced environmental impact. Companies focusing on biodegradable and recyclable formulations gain a competitive advantage. With stricter green building codes and rising consumer preference for eco-conscious solutions, innovation in bio-based PCMs can expand applications across construction, packaging, textiles, and cold-chain logistics, fueling market growth.

Threat:

Regulatory delays in construction applications

Regulatory delays represent a pressing threat for the PCM market, particularly in building and construction applications. New materials must undergo rigorous testing, certification, and approval before being adopted in structural projects. Lengthy approval timelines can stall deployment, especially in fast-moving urban construction markets. Regulatory inconsistencies across countries further complicate global adoption. These delays not only slow commercialization but also increase costs for developers and manufacturers, limiting PCM integration despite their energy-saving and environmental benefits.

Covid-19 Impact:

The COVID-19 pandemic initially disrupted the PCM market due to construction halts, supply chain breakdowns, and delayed industrial projects. However, the crisis underscored the importance of energy-efficient and sustainable infrastructure, creating renewed demand post-recovery. Cold-chain logistics, particularly for vaccine storage and distribution, significantly boosted PCM usage. Remote working also fueled interest in energy-saving building materials for residential projects. As construction and logistics sectors rebound, PCMs are positioned to benefit from long-term structural demand driven by sustainability-focused recovery policies.

The encapsulated PCM segment is expected to be the largest during the forecast period

The encapsulated PCM segment is expected to account for the largest market share during the forecast period, owing to its enhanced safety, controlled heat transfer, and adaptability across industries. Micro%- %and macro-encapsulation techniques protect PCMs from leakage and degradation, improving durability and efficiency. These formulations are widely used in green buildings, textiles, and cold-chain packaging, where reliability is critical. With increasing demand for thermal stability in complex systems, encapsulated PCMs have emerged as the preferred choice, ensuring the segment’s leadership throughout the forecast period.

The organic PCM segment is expected to have the highest CAGR during the forecast period

Over the forecast period, the organic PCM segment is predicted to witness the highest growth rate, reinforced by its superior stability, chemical safety, and renewable sourcing potential. Organic PCMs, such as paraffins and fatty acids, offer minimal supercooling and strong compatibility with building materials. Rising R&D investments in bio-based organics further expand their market scope. Their eco-friendly profile aligns with global sustainability goals, making them attractive for packaging, textiles, and energy storage applications. This positions the segment as the fastest-growing category.

Region with largest share:

During the forecast period, the Asia Pacific region is expected to hold the largest market share, ascribed to rapid urbanization, booming construction activity, and increasing government initiatives for energy efficiency. China, India, and Japan are investing heavily in green infrastructure and smart cities, where PCMs provide cost-effective energy management. Rising middle-class populations and strong manufacturing ecosystems further accelerate regional adoption. Moreover, Asia Pacific's robust packaging and textile industries strengthen PCM applications beyond construction, ensuring the region's dominance in both demand and production capacity.

Region with highest CAGR:

Over the forecast period, the North America region is anticipated to exhibit the highest CAGR associated with strong regulatory support, advanced R&D, and growing adoption of energy-saving technologies. The U.S. and Canada are actively investing in sustainable construction materials and cold-chain logistics infrastructure. Increasing consumer preference for green-certified buildings drives PCM integration into residential and commercial sectors. Startups and universities in the region are pioneering bio-based PCM innovations, enhancing competitiveness. With strong technological capabilities and sustainability commitments, North America is set to outpace other regions.

Key players in the market

Some of the key players in Phase Change Materials (PCM) Market include BASF SE, Climator Sweden AB, Solueta Group, Croda International Plc, Rubitherm Technologies GmbH, Mitsubishi Chemical Corporation, Honeywell International Inc., PCM Products Ltd, Phase Change Energy Solutions Inc., Microtek Laboratories Inc., Entropy Solutions Inc., NEI Corporation, Gnanomat S.L., Arkema S.A., and Dalian Xinghua Chemical Co., Ltd.

Key Developments:

In Aug 2025, Honeywell International Inc. introduced Solstice® Horizon PCM, a non-flammable, low-global-warming-potential (GWP) material for use in thermal energy storage systems that support the cooling of large data centers and commercial buildings.

In July 2025, Croda International Plc announced ThermaCool™ Organic PCM, a new bio-based material derived from sustainable sources for use in activewear and sportswear textiles, providing enhanced and longer-lasting cooling comfort for athletes.

In June 2025, Mitsubishi Chemical Corporation commercialized a new salt hydrate-based PCM with a precise phase change temperature of 5°C (41°F), specifically engineered for maintaining the cold chain in pharmaceutical and fresh food transport packaging.

Forms Covered:

- Encapsulated PCM
- Non-encapsulated PCM
- Shape-stabilized PCM

Materials Covered:

- Organic PCM
- Inorganic PCM
- Bio-based PCM
- Eutectic PCM

Temperature Ranges Covered:

- Low-Temperature PCM
- Medium-Temperature PCM
- High-Temperature PCM

Technologies Covered:

- Microencapsulation
- Macroencapsulation
- Nanoencapsulation

End Users Covered:

- Construction Industries
- Energy & Utilities
- Healthcare & Pharmaceuticals
- Automotive & Transportation
- Electronics & IT
- Textiles & Consumer Goods
- Aerospace & Defense

Regions Covered:

- North America
  - US
  - Canada
  - Mexico
- Europe
  - Germany

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- UK
- Italy
- France
- Spain
- Rest of Europe

Asia Pacific

- Japan
- China
- India
- Australia
- New Zealand
- South Korea
- Rest of Asia Pacific

South America

- Argentina
- Brazil
- Chile
- Rest of South America

Middle East & Africa

Saudi Arabia

UAE

Qatar

South Africa

Rest of Middle East & Africa

What our report offers:

- Market share assessments for the regional and country-level segments
- Strategic recommendations for the new entrants
- Covers Market data for the years 2024, 2025, 2026, 2028, and 2032
- Market Trends (Drivers, Constraints, Opportunities, Threats, Challenges, Investment Opportunities, and recommendations)
- Strategic recommendations in key business segments based on the market estimations
- Competitive landscaping mapping the key common trends
- Company profiling with detailed strategies, financials, and recent developments
- Supply chain trends mapping the latest technological advancements

Free Customization Offerings:

All the customers of this report will be entitled to receive one of the following free customization options:

Company Profiling

Comprehensive profiling of additional market players (up to 3)

SWOT Analysis of key players (up to 3)

Regional Segmentation

Market estimations, Forecasts and CAGR of any prominent country as per the client's interest (Note: Depends on feasibility check)

Competitive Benchmarking

- Benchmarking of key players based on product portfolio, geographical presence, and strategic alliances

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