

The Global Market for Thermal Management Materials and Systems 2024-2034

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Abstracts

Effective thermal management is critical across industries from microelectronics to electric vehicles to aerospace systems. With increasing power densities and decreasing form factors, innovative materials and design solutions are required to dissipate escalating heat loads. This report provided an overview of key technologies and techniques enabling safe, reliable and high performance thermal control. Main topics covered included:

Thermal management materials – Heat spreaders, heat sinks, phase change materials, thermal interface materials, and advanced composites.

Thermal management systems – Immersion cooling, battery thermal management, heat exchangers, thermoelectric coolers.

Direct liquid cooling – Microchannel heat sinks, jet impingement, spray cooling, and chip immersion techniques.

Passive heat transfer – Heat pipes, vapor chambers, and phase change materials.

Key areas covered include:

Thermal interface materials - greases, gels, pads, gap fillers

Heat spreaders and heat sinks - design, materials, optimization

Phase change materials - characteristics, electronics and battery applications

Immersion cooling systems - for high heat flux removal in data centers

Battery thermal management - for electric vehicles

Heat pipes and vapor chambers - operating principles, wick structures

Thermoelectric cooling - Peltier modules, precision temperature control

Direct chip cooling - microchannel heat sinks, jet impingement, spray cooling

Key market areas covered include:

Electronics cooling - CPUs, GPUs, power electronics for computing and data centers

Automotive cooling - powertrain components, battery thermal management for electric vehicles

Aerospace and space - avionics, instruments, thermal control systems for aircraft and spacecraft

Energy systems - photovoltaics, nuclear, turbine heat management

Industrial - motor drives, power supplies, high power lasers, RF amplifiers

Biomedical - medical imaging, analyzers, therapy devices

Consumer products - mobile phones, laptops, LED lighting, appliances

The report explores thermal management solutions across these diverse markets spanning from microelectronics to electric vehicles to avionics and space systems. Each market has unique requirements and challenges related to heat fluxes, environments, form factors, and performance needs. Key underlying technologies are examined in the context of enabling effective thermal control in these applications. The analysis provides

insights into applying advanced thermal management materials and techniques to meet critical needs in these technology sectors.

The report features profiles of 144 companies in thermal management. Companies profiled include 3M, Arieca, Artec Coolants, Carbice Corporation, CondAlign, Dexerials, Fujipoly, Henkel, Indium Corporation, KULR Technology Group, Inc., Parker-Hannifin Corporation, Senior Flexonics, Shin-Etsu Chemical Co., Ltd, and SHT Smart High-Tech AB.

Contents

1 INTRODUCTION

1.1 Thermal management

1.1.1 Active

1.1.2 Passive

1.2 Thermal Management Systems

1.2.1 Immersion Cooling Systems for Data Centers

1.2.2 Battery Thermal Management for Electric Vehicles

1.2.3 Heat Exchangers for Aerospace Cooling

1.3 Main types of thermal management materials and technologies

2 PHASE CHANGE MATERIALS

2.1 Properties of Phase Change Materials (PCMs)

2.2 Types

2.2.1 Organic/biobased phase change materials

2.2.1.1 Advantages and disadvantages

2.2.1.2 Paraffin wax

2.2.1.3 Non-Paraffins/Bio-based

2.2.2 Inorganic phase change materials

2.2.2.1 Salt hydrates

2.2.2.1.1 Advantages and disadvantages

2.2.2.2 Metal and metal alloy PCMs (High-temperature)

2.2.3 Eutectic mixtures

2.2.4 Encapsulation of PCMs

2.2.4.1 Macroencapsulation

2.2.4.2 Micro/nanoencapsulation

2.2.5 Nanomaterial phase change materials

2.3 Thermal energy storage (TES)

2.3.1 Sensible heat storage

2.3.2 Latent heat storage

2.4 Battery Thermal Management

3 THERMAL INTERFACE MATERIALS

3.1 What are thermal interface materials (TIMs)?

3.1.1 Types

- 3.1.2 Thermal conductivity
- 3.2 Comparative properties of TIMs
- 3.3 Advantages and disadvantages of TIMs, by type
- 3.4 Prices
- 3.5 Thermal greases and pastes
- 3.6 Thermal gap pads
- 3.7 Thermal gap fillers
- 3.8 Thermal adhesives and potting compounds
- 3.9 Metal-based TIMs
 - 3.9.1 Solders and low melting temperature alloy TIMs
 - 3.9.2 Liquid metals
 - 3.9.3 Solid liquid hybrid (SLH) metals
 - 3.9.3.1 Hybrid liquid metal pastes
 - 3.9.3.2 SLH created during chip assembly (m2TIMs)
- 3.10 Carbon-based TIMs
 - 3.10.1 Multi-walled nanotubes (MWCNT)
 - 3.10.1.1 Properties
 - 3.10.1.2 Application as thermal interface materials
 - 3.10.2 Single-walled carbon nanotubes (SWCNTs)
 - 3.10.2.1 Properties
 - 3.10.2.2 Application as thermal interface materials
 - 3.10.3 Vertically aligned CNTs (VACNTs)
 - 3.10.3.1 Properties
 - 3.10.3.2 Applications
 - 3.10.3.3 Application as thermal interface materials
 - 3.10.4 BN nanotubes (BNNT) and nanosheets (BNNS)
 - 3.10.4.1 Properties
 - 3.10.4.2 Application as thermal interface materials
 - 3.10.5 Graphene
 - 3.10.5.1 Properties
 - 3.10.5.2 Application as thermal interface materials
 - 3.10.5.2.1 Graphene fillers
 - 3.10.5.2.2 Graphene foam
 - 3.10.5.2.3 Graphene aerogel
 - 3.10.6 Nanodiamonds
 - 3.10.6.1 Properties
 - 3.10.6.2 Application as thermal interface materials
 - 3.10.7 Graphite
 - 3.10.7.1 Properties

- 3.10.7.2 Natural graphite
 - 3.10.7.2.1 Classification
 - 3.10.7.2.2 Processing
 - 3.10.7.2.3 Flake
 - 3.10.7.2.3.1 Grades
 - 3.10.7.2.3.2 Applications
- 3.10.7.3 Synthetic graphite
 - 3.10.7.3.1 Classification
 - 3.10.7.3.1.1 Primary synthetic graphite
 - 3.10.7.3.1.2 Secondary synthetic graphite
 - 3.10.7.3.1.3 Processing
 - 3.10.7.4 Applications as thermal interface materials
- 3.10.8 Hexagonal Boron Nitride
 - 3.10.8.1 Properties
 - 3.10.8.2 Application as thermal interface materials
- 3.11 Metamaterials
 - 3.11.1 Types and properties
 - 3.11.1.1 Electromagnetic metamaterials
 - 3.11.1.1.1 Double negative (DNG) metamaterials
 - 3.11.1.1.2 Single negative metamaterials
 - 3.11.1.1.3 Electromagnetic bandgap metamaterials (EBG)
 - 3.11.1.1.4 Bi-isotropic and bianisotropic metamaterials
 - 3.11.1.1.5 Chiral metamaterials
 - 3.11.1.1.6 Electromagnetic “Invisibility” cloak
 - 3.11.1.2 Terahertz metamaterials
 - 3.11.1.3 Photonic metamaterials
 - 3.11.1.4 Tunable metamaterials
 - 3.11.1.5 Frequency selective surface (FSS) based metamaterials
 - 3.11.1.6 Nonlinear metamaterials
 - 3.11.1.7 Acoustic metamaterials
 - 3.11.2 Application as thermal interface materials
- 3.12 Self-healing thermal interface materials
 - 3.12.1 Extrinsic self-healing
 - 3.12.2 Capsule-based
 - 3.12.3 Vascular self-healing
 - 3.12.4 Intrinsic self-healing
 - 3.12.5 Healing volume
 - 3.12.6 Types of self-healing materials, polymers and coatings
 - 3.12.7 Applications in thermal interface materials

3.13 Phase change thermal interface materials (PCTIMs)

3.13.1 Thermal pads

3.13.2 Low Melting Alloys (LMAs)

4 HEAT SPREADERS AND HEAT SINKS

4.1 Design

4.2 Materials

4.2.1 Aluminum alloys

4.2.2 Copper

4.2.3 Metal foams

4.2.4 Metal matrix composites

4.2.5 Graphene

4.2.6 Carbon foams and nanotubes

4.2.7 Graphite

4.2.8 Diamond

4.2.9 Liquid immersion cooling

4.3 Market overview

4.3.1 Applications

4.3.2 Market players

4.4 Challenges

5 HEAT EXCHANGERS

5.1 Design

5.2 Types

5.3 Key materials

5.4 Recent innovation

5.5 Market overview

5.5.1 Applications

5.5.2 Market players

6 LIQUID COOLING SYSTEMS

6.1 Design

6.2 Types

6.3 Liquid Coolants

6.4 Components of Liquid Cooling Systems

6.5 Benefits

- 6.6 Challenges
- 6.7 Recent innovation
- 6.8 Market overview

7 AIR COOLING

- 7.1 Introduction
- 7.2 Air Cooling Methods
- 7.3 Design
- 7.4 Recent innovation
- 7.5 Applications
- 7.6 Market overview

8 COOLING PLATES

- 8.1 Overview
- 8.2 Design
- 8.3 Enhancement Techniques
- 8.4 Applications
- 8.5 Recent innovation
- 8.6 Market overview

9 SPRAY COOLING

- 9.1 Overview
- 9.2 Heat Transfer Mechanisms
- 9.3 Spray Cooling Fluids
- 9.4 Applications
- 9.5 Recent innovation

10 IMMERSION COOLING

- 10.1 Overview
- 10.2 Common immersion fluids
- 10.3 Benefits
- 10.4 Challenges
- 10.5 Recent innovation

11 THERMOELECTRIC COOLERS

- 11.1 Thermoelectric Modules
- 11.2 Performance Factors
- 11.3 Electronics Cooling

12 COOLANT FLUIDS FOR EVS

- 12.1 Coolant Fluid Requirements
- 12.2 Common EV Coolant Fluids
- 12.3 Recent innovations

13 MARKETS FOR THERMAL MANAGEMENT MATERIALS AND SYSTEMS

- 13.1 Consumer electronics
 - 13.1.1 Market overview
 - 13.1.1.1 Market drivers
 - 13.1.1.2 Applications
 - 13.1.1.2.1 Smartphones and tablets
 - 13.1.1.2.2 Wearable electronics
 - 13.1.2 Global market revenues 2018-2034
- 13.2 Electric Vehicles (EV)
 - 13.2.1 Market overview
 - 13.2.1.1 Market drivers
 - 13.2.1.2 Applications
 - 13.2.1.2.1 Lithium-ion batteries
 - 13.2.1.2.1.1 Cell-to-pack designs
 - 13.2.1.2.1.2 Cell-to-chassis/body
 - 13.2.1.2.2 Electric motors
 - 13.2.1.2.3 Power electronics
 - 13.2.1.2.4 Charging stations
- 13.3 Data Centers
 - 13.3.1 Market overview
 - 13.3.1.1 Market drivers
 - 13.3.1.2 Applications
 - 13.3.1.2.1 Router, switches and line cards
 - 13.3.1.2.2 Servers
 - 13.3.1.2.3 Power supply converters
- 13.4 ADAS Sensors
 - 13.4.1 Market overview

- 13.4.1.1 Market drivers
- 13.4.1.2 Applications
 - 13.4.1.2.1 ADAS Cameras
 - 13.4.1.2.2 ADAS Radar
 - 13.4.1.2.3 ADAS LiDAR

13.5 EMI shielding

- 13.5.1 Market overview
 - 13.5.1.1 Market drivers
 - 13.5.1.2 Applications

13.6 5G

- 13.6.1 Market overview
 - 13.6.1.1 Market drivers
 - 13.6.1.2 Applications
 - 13.6.1.2.1 Antenna
 - 13.6.1.2.2 Base Band Unit (BBU)

14 GLOBAL REVENUES FOR TIMS

- 14.1 Global revenues for 2022, by type
- 14.2 Global revenues 2023-2033, by materials type
 - 14.2.1 Telecommunications market
 - 14.2.2 Electronics and data centers market
 - 14.2.3 ADAS market
 - 14.2.4 Electric vehicles (EVs) market
- 14.3 By market
- 14.4 Global revenues for thermal management materials and systems 2018-2034, by region

15 FUTURE MARKET OUTLOOK

16 COMPANY PROFILES 184 (144 COMPANY PROFILES)

17 RESEARCH METHODOLOGY

18 REFERENCES

List Of Tables

LIST OF TABLES

- Table 1. Comparison active and passive thermal management.
- Table 2. Common PCMs used in electronics cooling and their melting temperatures.
- Table 3. Properties of PCMs.
- Table 4. PCM Types and properties.
- Table 5. Advantages and disadvantages of organic PCMs.
- Table 6. Advantages and disadvantages of organic PCM Fatty Acids.
- Table 7. Advantages and disadvantages of salt hydrates
- Table 8. Advantages and disadvantages of low melting point metals.
- Table 9. Advantages and disadvantages of eutectics.
- Table 10. Thermal conductivities (?) of common metallic, carbon, and ceramic fillers employed in TIMs.
- Table 11. Commercial TIMs and their properties.
- Table 12. Advantages and disadvantages of TIMs, by type.
- Table 13. Thermal interface materials prices.
- Table 14. Characteristics of some typical TIMs.
- Table 15. Properties of CNTs and comparable materials.
- Table 16. Typical properties of SWCNT and MWCNT.
- Table 17. Comparison of carbon-based additives in terms of the main parameters influencing their value proposition as a conductive additive.
- Table 18. Thermal conductivity of CNT-based polymer composites.
- Table 19. Comparative properties of BNNTs and CNTs.
- Table 20. Properties of graphene, properties of competing materials, applications thereof.
- Table 21. Properties of nanodiamonds.
- Table 22. Comparison between Natural and Synthetic Graphite.
- Table 23. Classification of natural graphite with its characteristics.
- Table 24. Characteristics of synthetic graphite.
- Table 25. Properties of hexagonal boron nitride (h-BN).
- Table 26. Types of self-healing coatings and materials.
- Table 27. Comparative properties of self-healing materials.
- Table 28. Benefits and drawbacks of PCMs in TIMs.
- Table 29. Challenges with heat spreaders and heat sinks.
- Table 30. Global revenues for thermal management materials and systems, 2018-2034, by type.
- Table 31. Global revenues for TIMs 2018-2034, by market (millions USD)

Table 32. Carbodeon Ltd. Oy nanodiamond product list.

Table 33. CrodaTherm Range.

Table 34. Ray-Techniques Ltd. nanodiamonds product list.

Table 35. Comparison of ND produced by detonation and laser synthesis.

List Of Figures

LIST OF FIGURES

Figure 1. Phase-change TIM products.

Figure 2. PCM mode of operation.

Figure 3. Classification of PCMs.

Figure 4. Phase-change materials in their original states.

Figure 5. Thermal energy storage materials.

Figure 6. Phase Change Material transient behaviour.

Figure 7. (L-R) Surface of a commercial heatsink surface at progressively higher magnifications, showing tool marks that create a rough surface and a need for a thermal interface material.

Figure 8. Schematic of thermal interface materials used in a flip chip package.

Figure 9. Thermal grease.

Figure 10. Dispensing a bead of silicone-based gap filler onto the heat sink of a power electronics module.

Figure 11. Application of thermal silicone grease.

Figure 12. A range of thermal grease products.

Figure 13. Thermal Pad.

Figure 14. Dispensing a bead of silicone-based gap filler onto the heat sink of a power electronics module.

Figure 15. Thermal tapes.

Figure 16. Thermal adhesive products.

Figure 17. Typical IC package construction identifying TIM1 and TIM2

Figure 18. Liquid metal TIM product.

Figure 19. Pre-mixed SLH.

Figure 20. HLM paste and Liquid Metal Before and After Thermal Cycling.

Figure 21. SLH with Solid Solder Preform.

Figure 22. Automated process for SLH with solid solder preforms and liquid metal.

Figure 23. Schematic diagram of a multi-walled carbon nanotube (MWCNT).

Figure 24. Schematic of single-walled carbon nanotube.

Figure 25. Types of single-walled carbon nanotubes.

Figure 26. Schematic of a vertically aligned carbon nanotube (VACNT) membrane used for water treatment.

Figure 27. Schematic of Boron Nitride nanotubes (BNNTs). Alternating B and N atoms are shown in blue and red.

Figure 28. Graphene layer structure schematic.

Figure 29. Illustrative procedure of the Scotch-tape based micromechanical cleavage of

HOPG.

Figure 30. Graphene and its descendants: top right: graphene; top left: graphite = stacked graphene; bottom right: nanotube=rolled graphene; bottom left: fullerene=wrapped graphene.

Figure 31. Detonation Nanodiamond.

Figure 32. DND primary particles and properties.

Figure 33. Flake graphite.

Figure 34. Applications of flake graphite.

Figure 35. Graphite-based TIM products.

Figure 36. Structure of hexagonal boron nitride.

Figure 37. Classification of metamaterials based on functionalities.

Figure 38. Electromagnetic metamaterial.

Figure 39. Schematic of Electromagnetic Band Gap (EBG) structure.

Figure 40. Schematic of chiral metamaterials.

Figure 41. Nonlinear metamaterials- 400-nm thick nonlinear mirror that reflects frequency-doubled output using input light intensity as small as that of a laser pointer.

Figure 42. Schematic of self-healing polymers. Capsule based (a), vascular (b), and intrinsic (c) schemes for self-healing materials. Red and blue colours indicate chemical species which react (purple) to heal damage.

Figure 43. Stages of self-healing mechanism.

Figure 44. Self-healing mechanism in vascular self-healing systems.

Figure 45. Comparison of self-healing systems.

Figure 46. PCM TIMs.

Figure 47. Phase Change Material - die cut pads ready for assembly.

Figure 48. Schematic of TIM operation in electronic devices.

Figure 49. Schematic of Thermal Management Materials in smartphone.

Figure 50. Wearable technology inventions.

Figure 51. Global market revenues in electronics 2018-2024, by type, million USD.

Figure 52. Application of thermal interface materials in automobiles.

Figure 53. EV battery components including TIMs.

Figure 54. Battery pack with a cell-to-pack design and prismatic cells.

Figure 55. Cell-to-chassis battery pack.

Figure 56. TIMS in EV charging station.

Figure 57. Image of data center layout.

Figure 58. Application of TIMs in line card.

Figure 59. ADAS radar unit incorporating TIMs.

Figure 60. Coolzorb 5G.

Figure 61. TIMs in Base Band Unit (BBU).

Figure 62. Global revenues for thermal management materials and systems,

2018-2034, by type.

Figure 63. Global revenues for thermal management materials and systems in telecommunications, 2018-2034, by type.

Figure 64. Global revenues for thermal management materials and systems in electronics & data centers, 2018-2034, by type.

Figure 65. Global revenues for thermal management materials and systems in ADAS, 2018-2034, by type. Source: Future Markets, Inc.

Figure 66. Global revenues for thermal management materials and systems in Electric Vehicles (EVs), 2018-2034, by type.

Figure 67. Global revenues for TIMs 2018-2033, by market.

Figure 68. Boron Nitride Nanotubes products.

Figure 69. Transtherm® PCMs.

Figure 70. Carbide carbon nanotubes.

Figure 71. Internal structure of carbon nanotube adhesive sheet.

Figure 72. Carbon nanotube adhesive sheet.

Figure 73. HI-FLOW Phase Change Materials.

Figure 74. Thermoelectric foil, consists of a sequence of semiconductor elements connected with conductive metal. At the top (in red) is the thermal interface.

Figure 75. Parker Chomerics THERM-A-GAP GEL.

Figure 76. Cr?do™ ProMed transport bags.

Figure 77. Metamaterial structure used to control thermal emission.

Figure 78. Shinko Carbon Nanotube TIM product.

Figure 79. The Sixth Element graphene products.

Figure 80. Thermal conductive graphene film.

Figure 81. VB Series of TIMS from Zeon.

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