

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, Arteco 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.



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