Passive Cooling Materials and Devices: New Markets 2023-2043

Tuesday 25 April, 2023

- Market forecasts 2023-2043 in 28 lines
- Maturity curves for 12 technologies 4
- Recommended latest references 73
- Pie charts of extra data 10
- Companies mentioned 93+
- Detailed roadmaps 2
- SWOT appraisals 7
- Key conclusions 16
- New info-grams 52
- Pages 318

This report is created to assist you to create a billion-dollar materials or device business from the emerging passive cooling market at $177 billion in 2043. It will also be extremely useful to those seeking the best cooling for their future products and systems. Uniquely, the Zhar Research report, "Passive Cooling Materials and Devices: New Markets 2023-2043" reveals your total opportunity. That market is leaping almost fourfold for the sophisticated materials and subsystems now required. 58% of that value market will be for electronics and electrical engineering systems including electric vehicles, information, computer and telecommunications ICT structures and devices. Also importantly, 25% of the total market will be for buildings (global warming, improved living standards., emerging nations in tropics) so this breadth of demand de-risks your investment and this report analyses and predicts all of it.

Help cool the hotter data centres, vast areas of solar panel, forthcoming 6G Communications, liquid, and compressed air long duration electricity storage and by electric vehicles by land, water and air. All appraised in this report revealing your opportunities and gaps in the market. The higher added-value materials emerging vary from aerogels, hydrogels, and new polymer blends, annealed pyrolytic graphite, graphene composites, 3D porous boron nitride, hollow silica microspheres and thermal liquids loaded with various metal oxides to increase thermal capacity. Your skills in silicones and polyacrylates are also necessary in increasingly sophisticated forms but that is part of a long list identified.

Learn your opportunities in the next generations such as Passive Daylight Radiative Cooling PDRC and Insulated Cooling with Evaporation and Radiation ICER. After all, the report calculates strong growth in reinvented conductive, convective and phase change passive cooling but even faster growth in radiative cooling including the new metamaterial and advanced optronics approaches as well as that PDRC and ICER.

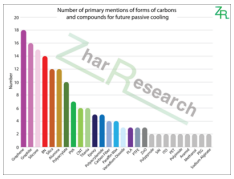
The executive summary and conclusions are sufficient in itself for those in a hurry. It consists of 30 pages of analysis presented very clearly in new infographics, images and tables including markets that will drop, not just the rosy picture. No nostalgia or rambling text because the focus is business opportunities 2023-2043. Then come 23 pages of forecasts and roadmaps including background forecasts such as those for the smartphones, base stations etc. needing your products.

Chapter 2. "**Current situation, changing needs, new options 2023-2043**" takes 52 pages to surface the many needs for better cooling, the new approaches to this and the companies involved. The rest of the report analyses the technologies linked to emerging needs. All highlight the most popular materials, structures and targetted new applications in the latest research pipeline with Zhar Research analysis. That includes solutions for smart cities, 6G Communications in two phases from 2030 and next data centers.

Chapter 3. "**Passive radiative and heat sink radiative/ convective cooling, passive liquid cooling: emerging materials and devices toolkit 2023-2043**" needs 53 pages because so much is happening with next radiative and convective passive cooling. Most is on that busy radiative cooling sector because most convective cooling involves active approaches to forced air and liquid covered in a sister report on active cooling, though the renewed interest in passive immersion cooling and other options are covered. The closely linked subjects of metamaterial and advanced optronic cooling having their own chapter.

Chapter 4 addresses "**Passive conductive cooling: emerging materials and devices toolkit 2023-2043**". In 43 pages it addresses needs from heavy industry to cooling quantum dots and particularly focuses on design issues, emerging thermal interface materials, morphologies and next

Media:



Related Sectors:

Computing & Telecoms :: Consumer Technology :: Education & Human Resources :: Environment & Nature :: Manufacturing, Engineering & Energy :: Media & Marketing ::

Related Keywords:

Cooling :: Passive Cooling :: New Materials :: Emerging Technology :: Technology :: Metamaterials :: Hydrogel :: Forecast ::

Scan Me:

polymer choices, blends and particulate additives. Here is graphite in thermally conductive concrete, as annealed pyrolytic forms, even graphene arriving for example.

Chapter 5 “**Passive phase change cooling: evaporative, heat pipe, solid state: emerging materials and devices toolkit 2023-2043**” needs 52 pages to make sense of this exceptionally active area. It particularly addresses cooling by latent heat of evaporation and melting in both closed systems such as heat pipes and the trending vapor chambers and open systems. See microscale heat pipes for the imminent one-kilowatt microchips, hydrogel cooling evolving from medical and cosmetic patches to building applications. Importantly, here are options for phase change cooling of all those solar panels arriving.

Chapter 6 at 22 pages explains the magic of metamaterials and advanced optronic devices. They will even create the opposite of a greenhouse and of a magnifying glass concentrating the sun to create a fire. Yes – cooling in both cases. As in the other chapters, all assertions are backed by many research papers, particularly the latest from 2023.

Chapter 7 presents your opportunities from the trend to multi-mode cooling such as that ICER and practical forms of PDRC. Called, “**Passive multi–mode, multi-purpose integrated cooling**” it also covers multipurpose subsystems, even multipurpose materials called structural electronics and multifunctional composites which may do the cooling task but double for load-bearing, optical and other functions as with the many emerging forms of window that passively cool. Only 25 pages for that because so many have been covered in earlier chapters.

Your opportunities for passive cooling materials, subsystems and complete products will span more than the typical coverage of other reports, making the unique Zhar Research report, “Passive Cooling Materials and Devices: New Markets 2023-2043” essential reading. It is constantly updated so, at the time of purchase, you get the latest in this rapidly evolving subject.

Company Contact:

Zhar Research

E. anastasiams@zharresearch.com
W. https://www.zharresearch.com/

Additional Contact(s):
Dr Peter Harrop
peterharrop@zharresearch.com

View Online

Additional Assets:

Newsroom: Visit our Newsroom for all the latest stories:
https://www.zhar-research.pressat.co.uk