

Aerospace ceramics: Global markets to 2029

The global market for aerospace ceramics was valued at \$5.3 billion in 2023 and is expected to grow at a compound annual growth rate (CAGR) of 8.0% to reach \$8.2 billion by the end of 2029.

According to the International Energy Agency, the aviation industry was responsible for 2.5% of global carbon emissions in 2023. To achieve net-zero emissions, this sector must undergo transformation driven by the push for greener aviation materials and technologies, sustainability mandates, and environmental regulations.

Aerospace ceramics are one way to improve the sustainability of the aviation industry. These advanced materials exhibit superior thermal and electrical performance and lightweight properties, leading to enhanced aircraft performance, including fuel efficiency, greater speed, range, and payload capacity. They are primarily found in thermal protection shields, engine and exhaust systems, and structures for aircraft.

Types of aerospace ceramics:

- **Ceramic matrix composites (CMCs)** are a class of engineered ceramics composed of ceramic fibers embedded in a ceramic matrix. They offer enhanced damage tolerance compared to traditional bulk ceramics because when cracks propagate through the matrix, they are deflected by the fiber reinforcement, preventing sudden failure. CMCs are increasingly used in turbine blades, combustor liners, and thermal protection systems, and they accounted for 62.6% of the market for aerospace ceramics in 2023.
- **Oxide ceramics**, particularly alumina and zirconia, are integral to aerospace applications due to their

superior electrical insulation properties, corrosion resistance, and mechanical strength. These ceramics are preferred materials in barrier coatings for gas turbines and jet engines, where they protect components from the extremely hot and oxidizing environment.

- **Nonoxide ceramics** have exceptional endurance to harsh environments, especially in reducing and vacuum environments, where oxide ceramics may deteriorate because of phase change. Moreover, they exhibit a higher strength-to-weight ratio than most metals, making them ideal for lightweight aerospace structures.

Aerospace researchers are also developing components with ultrahigh-temperature ceramics (UHTCs). These transition metal carbides, nitrides, and borides are distinguished by their exceptional oxidation ablation resistance and melting points above 3,000°C. However, some of the materials used in UHTCs are sourced from limited suppliers, making international collaboration and trade vital to the supply chain's functioning.

The market for aerospace ceramics is segmented into structural, thermal, and electrical applications. While structural applications hold the largest market share (57.2% in 2023), thermal applications are expected to grow fastest, driven by the demand for ceramics material that exhibits heat conductivity, thermal shock resistance, and phase stability.

Meanwhile, the rising demand for electric aircraft is driving the growth of electrical aerospace ceramic applications (Table 1).

North America is the largest revenue-generating market for aerospace ceramics, accounting for 48% of the global aerospace ceramics market in 2023. This market dominance is due to North America being home to major aerospace original equipment manufacturers such as Boeing, Lockheed Martin, Northrop Grumman, and RTX Corp. The presence of advanced ceramic material suppliers such as CoorsTek, Applied Ceramics, Ceramco, and Advanced Ceramic Materials further strengthens North America's position in aerospace ceramics innovation.

About the author

BCC Publishing Staff provides comprehensive analyses of global market sizing, forecasting, and industry intelligence, covering markets where advances in science and technology are improving the quality, standard, and sustainability of businesses, economies, and lives. Contact the staff at utkantha.srivastava@bccresearch.com.

Resource

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Table 1. Global market for aerospace ceramics, by application, through 2029 (\$ millions)

Application	2023	2024	2029	CAGR % (2024–2029)
Structural	3,056.5	3,201.2	4,641.7	7.7
Thermal	1,508.7	1,615.3	2,603.5	10.0
Electrical	777.5	793.5	994.4	4.6
Total	5,342.7	5,610.0	8,239.6	8.0