Ceramics Supporting Thermal Management

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Welcome… and Expectations

- High-level overview on the role of ceramics in thermal management
- How The American Ceramic Society supports this mission
- An overview of this year’s CEX

Thermal Management Challenges in the 21st Century

Specific Sectors

- **Electronics**
- **Energy**
- **Aerospace**

The global market for thermal management technologies was valued at $18.5 billion in 2024 and is expected to grow at a compound annual growth rate (CAGR) of 8.6% to reach $30 billion by the end of 2030. (BCC Research Report SMC024P: "The global market for thermal management technologies") (Summary published in March 2026 Bulletin)

Ceramics – No Stranger to Thermal Management

Refractory Ceramics

Refractory ceramics have been used for thousands of years to support early human use of fire for pottery and metallurgy, as described in a special three-part *Ceramic Tech Today* series on bricks called “The urban fabric of brick”







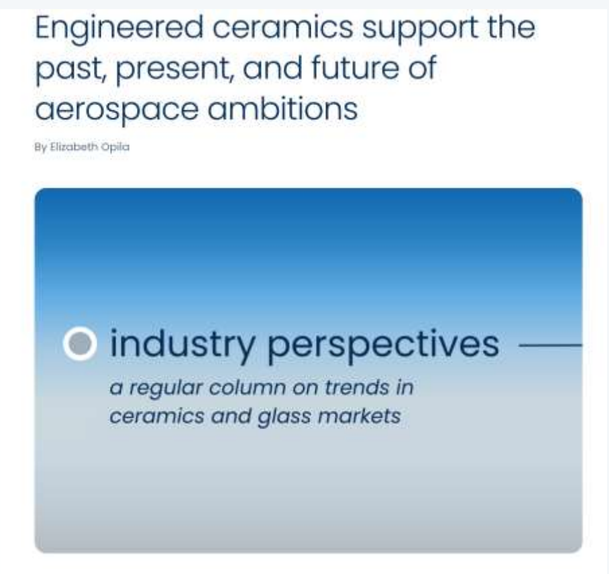


Advanced Ceramics Enter the Chat

NASA used ceramic tiles designed by University of Washington engineer **James Mueller** and his team to protect the Space Shuttle during reentry in 1981.

Ceramics are still routinely used for thermal and environmental barrier coatings on modern aircraft

ACerS Engineering Ceramics Division works in this area (and more) and meets every January in Daytona Beach, FL at ICACC



Innovations in Electronics

Silicon carbide semiconductors replacing traditional silicon semiconductors = big impact in electronics sector.

Silicon carbide electronics now being developed for use in high-voltage power supplies, electric vehicles, aerospace devices, and nuclear energy systems.

ACerS Electronics Division works in this area (and more) and meets annually at ACerS Spring Meeting.



Ceramic Materials in Nuclear Energy

The development of TRISO fuel for safer operations relies on several layers of ceramic materials to better manage the heat involved in fission reactions.

Read about Ultra Safe Nuclear's development of TRISO fuel, as described in a September 2022 *Bulletin* feature story, and an August 2025 *Bulletin* feature story

Both our Energy and Materials Systems and Glass and Optical Materials Divisions are doing work in these areas; meet annually at ACerS Spring Meeting.





ACerS Members Leading the Way…

2026 Webinars

- "Processing and characterization of ultra-high temperature ceramic matrix composites" – Antonio Vinci, Institute of Science, Technology, and Sustainability for Ceramics (Italy)
- "Deploying advanced nuclear reactors – A Missouri perspective" – Joseph W. Newkirk, Missouri S&T
- "Engineered perovskite oxides for versatile applications in SOFCs, SOECs and rSOCs" – Leonardo Duranti, University of Rome Tor Vergata (Italy)
- "Electrocaloric ceramics for solid-state cooling with emphasis on $BaTiO_3$-based lead-free materials exhibiting high and tunable Curie temperatures" – Umut Adem, Izmir Institute of Technology (Türkiye)

ACerS Hypersonics Training Program

- Why ceramics, why hypersonics?
- What is the program?
- What the courses cover
- How it reaches people
  - **Conference short courses attached to major meetings (CMS, HTCMC-12/GFMAT-3, NSMMS, Keystone Space, CACC at Mines)**
  - **Virtual workshops for broader, geographically distributed access, all Distro A**
  - **Regional and on-site courses at primes, DOD facilities, and national labs (NASA Johnson, Sandia, others in development) Typically at an ITAR level**
  - **K–12 teacher workshops through CGIF, including a June 2026 program with the Northern California Section and a teacher tour of NASA Ames**

ACerS Hypersonics Training Program

Key numbers

- **220+ participants in the original program (Jan 2024–2025)**
- **~60% from prime contractors and supply chain**
- **~25% from military and government**
- **18 planned activities in the two-year extension**
- **In addition to in-person training associated with conferences the two-year extension includes K–12 teacher workshops with CGIF as well as, virtual and regional on-site workshops**



Credit: NASA

ACerS Hypersonics Training Program

Upcoming courses

- **Prof. Erica Corral (Arizona) and Dr. Carmen Carney (AFRL) High-Temperature Testing of Materials for Extreme Environments course at HTCMC-12/GFMAT-3 (May 31)**
- **June 23 & 25: Teacher training outreach and NASA Ames tour**
- **NASA Johnson Space Flight Center Aug 4 & 5: Two-day course on Thermal protection systems and tour of NASA**
- **Aug 19: CCAC at Mines: Bill Carty (Alfred, ret.) & Carolina Tallon (VaTech)**
- **Two-day virtual course: October (date TBD): Joining of dissimilar materials and CMCs**

Recap – Why ACerS?

- Our people
- Our products
- Our networking opportunities
- Our cutting-edge science





CGIF | CERAMIC AND GLASS INDUSTRY FOUNDATION







THANK YOU

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