



Ultra-High Temperature Ceramics: Materials for Extreme Environment Applications

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The first comprehensive book to focus on ultra-high temperature ceramic materials in more than 20 years

Ultra-High Temperature Ceramics are a family of compounds that display an unusual combination of properties, including extremely high melting temperatures ($>3000^{\circ}\text{C}$), high hardness, and good chemical stability and strength at high temperatures. Typical UHTC materials are the carbides, nitrides, and borides of transition metals, but the Group IV compounds (Ti, Zr, Hf) plus TaC are generally considered to be the main focus of research due to the superior melting temperatures and stable high-melting temperature oxide that forms in situ. Rather than focusing on the latest scientific results, *Ultra-High Temperature Ceramics: Materials for Extreme Environment Applications* broadly and critically combines the historical aspects and the state-of-the-art on the processing, densification, properties, and performance of boride and carbide ceramics.

In reviewing the historic studies and recent progress in the field, *Ultra-High Temperature Ceramics: Materials for Extreme Environment Applications* provides:

- Original reviews of research conducted in the 1960s and 70s
- Content on electronic structure, synthesis, powder processing, densification, property measurement, and characterization of boride and carbide ceramics.
- Emphasis on materials for hypersonic aerospace applications such as wing leading edges and propulsion components for vehicles traveling faster than Mach 5
- Information on materials used in the extreme environments associated with high speed cutting tools and nuclear power generation

Contributions are based on presentations by leading research groups at the conference "Ultra-High Temperature Ceramics: Materials for Extreme Environment Applications II" held May 13-19, 2012 in Hernstein, Austria. Bringing together disparate researchers from academia, government, and industry in a singular forum, the meeting cultivated didactic discussions and efforts between bench researchers, designers and engineers in assaying results in a broader context and moving the technology forward toward near- and long-term use. This book is useful for furnace manufacturers, aerospace manufacturers that may be pursuing hypersonic technology, researchers studying any aspect of boride and carbide ceramics, and practitioners of high-temperature structural ceramics.

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