

Editorial

Ultra High Temperature Ceramics for Aerospace Applications

Improved interest in ultra-high-temperature ceramics (UHTCs) is being animating the scientific community. This emerging attention is driven by the demand of developing re-usable hot structures as thermal protection systems of aerospace vehicles, able to re-enter in planetary atmospheres at relatively high speed (order of 8-11 Km/s). In contrast to traditional blunt capsules or Shuttle-like vehicles, characterised by poor gliding capabilities and complex thermal protection systems, the future use of UHTCs opens new horizons for the development of spaceplanes with slender fuselage noses and sharp wing leading edges. Advanced aerodynamic configurations reduce the vehicles drag, enhance the vehicles performances, due to a larger manoeuvrability resulting in larger down range, cross range and abort windows, and reduce electromagnetic interferences and communications black-out. Analysis has shown that materials with temperature capability approaching 2000°C and above will be required for these space vehicles, but the state of the art Reinforced Carbon-Carbon (RCC) material, currently used on the Space Shuttle, have maximum use temperatures of approximately 1650°C.

The articles collected in this issue provide state-of-art scientific advancements on the subject with particular attention to the potential technological applications. The papers specifically deal with research studies on monolithic ceramic materials, composed primarily of Zirconium and Hafnium Diborides with different additives. The activities are carried out at materials level, with furnace or arc-jet testing, or include developments of UHTC-based hot structures at sub-component level. In the latter case, ultra-high temperature ceramic prototype structures have been developed and tested with embedded structural health monitoring systems.

I want to thank all the article contributors for their manuscripts. I hope they will be useful for future basic and applied researches on the subject.

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