

Ultra-high Temperature Ceramics

Novel ceramic materials to withstand temperatures up to 3000°C



<https://www.pexels.com/photo/space-rocket-launching-73871/>

IP Status

Patent application submitted

Seeking

Development partner

About **University of Birmingham**

At the University of Birmingham our research leads to new inventions and fuels innovation and business growth.

Background

At atmospheric re-entry a spacecraft has such high speeds that the molecules of air are broken apart, generating electric plasma and such enormous heat that a special thermal protection system is required to enable the aircraft for further reuse.

Ultra-high temperature ceramics (UHTCs) are candidate materials for use in extreme conditions, for example, hypersonic flight, atmospheric re-entry vehicles and thermal protection systems (TPS) for rocket nozzles as they typically possess good chemical stability, high thermal conductivity, high strength and melting points over 3000°C. Although these materials may be brittle and may fail when exposed to sudden high heat fluxes, they are highly applicable for use in ultra-high temperature ceramic matrix composites (UHTCMCs).

Tech Overview

The technology developed by researchers from the University of Birmingham is a novel composite ceramic material, that has been successfully demonstrated to withstand temperatures up to 3000 °C and be capable of withstanding both oxidation and thermo-ablation. This composite offers greater protection at lower cost and with a smaller weight penalty than any other materials currently being researched.

Benefits

- More resistant to ultra-high temperatures, oxidation and thermo-ablation than any other existing composite: successfully withstands temperatures up to 3000°C for many minutes;
- Cost-effective and lightweight: costs less and lower in mass than other high performance composites whilst offering greater protection.

Applications

- Rocket nozzles;
- Atmospheric re-entry vehicles;
- Hypersonic flight.

Opportunity

Co-development.