



# TS4E | 2026

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***Yttria stabilized zirconia deposited using suspension plasma spraying: a comparative framework with electron beam physical vapour deposition and air plasma spraying***

**Abstract:**

Emerging technological advancements are aimed at improving the operating temperatures of the gas turbine engines to improve their overall efficiency. This has triggered the development of yttria stabilized zirconia based thermal barrier coatings (YSZ-TBC) with microstructures designed for enhanced performance achieved by optimizing process parameters and deposition techniques. The present study aims to evaluate the performance of YSZ columnar structure deposited using suspension plasma spraying (SPS) on Pt-Al bond coated CMSX-4 single crystal Nickel based superalloy substrate, reported for the first time in the literature. The thermal cycling performance and calcium-magnesium-alumino-silicate (CMAS) corrosion behaviour of SPS YSZ coatings were compared with YSZ deposited using electron beam physical vapour deposition (EBPVD) and air plasma spraying (APS) techniques. It was observed that SPS YSZ coatings showed the highest thermal cycling resilience when compared EBPVD and APS. In addition to this, the CMAS penetration was also substantially lower in SPS YSZ coatings compared to EBPVD and APS coatings. Unlike SPS and EBPVD coatings, APS coatings also showed signs of tetragonal to monoclinic phase transitions in some regions away from the top surface. These observations lays the baseline for the potential development of optimized microstructures using SPS deposition technique with improved performance relevant to the TBCs.

**Biography:**

Tanvir Hussain is an internationally distinguished researcher in Coatings and Surface Engineering, with 170 peer-reviewed articles in internationally leading journals that shaped the academic discipline. He has been consistently within the top 2% of the scientists worldwide, as reported by the Stanford University. His research focuses on advanced coatings and surface engineering for aerospace, automotive, renewable energy and healthcare sectors. He is particularly interested in the understanding of novel materials processing techniques, especially thermal spray and cold gas dynamic spray. Process-microstructure-properties relationship is at the heart of his research. As a thought leader, he has found the sub-disciplines of composite sprayed coatings. His outstanding academic distinction and established reputation for academic excellence include 27 Keynote and Invited talks at international conferences. He was inducted as a Fellow of ASM International (FASM), the world's largest association of materials-centric engineers and scientists. His active research grants at UoN as a PI and Co-I total £9.031 m, of which £4.176 m as a PI. He holds an EPSRC Research Fellowship (£1.7 m), working on new frontiers in materials discovery with 7 PDRAs. He is a Co-Director of EPSRC CDT in Digital Metal, Co-

Director of Marie Curie Doctoral Training Network REMAKE, and Co-Director of EPSRC Network+ IGNITE+. His advisory role includes EPSRC Manufacturing & Circular Economy Strategic Advisory Team (SAT). He regularly chairs EPSRC Responsive Mode Engineering Prioritisation Panels. His major leadership at UKRI includes Chair of the Future Leaders Fellowship (FLF) sift and interview panels in rounds 8 and 9. His stewardship as an Editor of the Journal of European Ceramic Society (Elsevier) (2nd Ceramic category) demonstrates his worldwide standing in cutting-edge ceramics. He is currently an Associate Head of the Department for supporting colleagues.



**Rogério Lima**, National Research Council Canada - NRC

***Manufacturing APS YbDS-based EBCs: Insights on Crystallization and Mechanical Behaviour***

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