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Toward Ultra-High Porous Gadolinium Zirconate Thermal Barrier Coatings by Suspension Plasma Spraying

Abstract:

Suspension plasma-sprayed (SPS) gadolinium zirconate (GZO) coatings were developed for advanced thermal barrier coating (TBC) applications. The increasing industrial demand for lower thermal conductivity coatings for combustion engine applications has driven the development of highly porous coating architectures with improved thermal insulation performance.

In the present study, SPS processing parameters were systematically modified to produce ultra-high porous GZO coatings. The influence of spray conditions, including stand-off distance (SOD), plasma current, and nozzle size, on microstructural features, including porosity content and distribution, crack formation, and columnar morphology, together with thermophysical properties such as thermal conductivity, was investigated to identify processing conditions suitable for next-generation high-temperature thermal barrier coatings.