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Evaluation of LaAlO_3 as material for thermal barrier coatings

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Thermal Barrier Coatings (TBCs) are used to protect and insulate the metallic gas turbine engine component from the hot gas stream, against high temperature corrosion, and subsequent damage. Improvement in this field will facilitate higher combustion temperatures and thus improved engine efficiency not only in power generation but also in aerospace and marine propulsion. Materials exhibiting perovskite structure in particular have attracted much attention as replacements of the state-of-the-art materials mainly due to their high melting point, high coefficient of thermal expansion and relatively low thermal conductivity. The drawback of materials exhibiting simple perovskite structure is mainly their inferior fracture-related mechanical properties. In this study we evaluate simple structured LaAlO_3 (LA) in TBC applications, by means of solution precursor thermal spraying (SPTS). LA solution precursors were synthesized and characterized, towards their flow-related characteristics, and capability to deliver stoichiometric perovskite structures. The concentration of the solution was set to demonstrate a viscosity of ca. 3 cP, while XRD and ATR-IR confirmed the formation of pure perovskite. Coefficient of thermal expansion (CTE) was measured on LA pellets of different porosity and sintering temperatures and pertaining variations with thermal cycles were recorded. Thermal treatment at 1300°C for 100 h, confirmed the phase stability of the structure. SPTS deposition of LA was performed and process parameters were tuned towards final coating performance optimization.

Biography

V N Stathopoulos has BSc Chemistry, PhD Physical Chemistry, and Postdoctoral studies from Johannes Gutenberg Univeristat Mainz, Germany. He is the head of Laboratory of Chemistry and Materials Technology, Technological Educational Institute of Sterea Ellada, Greece. His research is focused on oxide ceramics with environmental and energy applications incl. catalysis. He is the coordinator of an EU project (12 partners/8 countries) and well experienced in the management of projects for the private and academic sector. He is author of over 25 scientific publications, >90 conference presentations and several technical papers in the private sector.

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