# Rare earth modified lanthanum zirconate thermal barrier coatings by EB-PVD: thermal performance, morphology and degradation behavior

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**Abstract** Thermal barrier coatings have been widely investigated over the last decade. Lanthanum zirconate is known for its high melting point and good thermal stability in aircraft engine environment. Owing to the distinctive thermophysical properties, Y, Pr or Eu doping in pyrochlore $La_2Zr_2O_7$ might be a promising TBCs material as the top ceramic layer. It remains a challenge to completely understand the rare earth doped $La_2Zr_2O_7$/YSZ double ceramic layer TBCs properties and microstructure evolution during thermal cyclic. In our present work, rare earth doped $La_2Zr_2O_7$/YSZ double ceramic layer TBCs have been prepared by EB-PVD. The phase structure, thermal performance, microstructure and thermal cyclic lifetime have been researched. Thermal conductivity has been decreased compared with YSZ and pure $La_2Zr_2O_7$, simultaneously, coefficient of thermal expansion has been increased compared with pure $La_2Zr_2O_7$. The failure behavior of rare earth doped $La_2Zr_2O_7$/YSZ double ceramic layer TBCs have been elucidated as typical TGO growth mode and specific sintering crack evolution mode. This study of properties and failure behaviors might provide the valuable investigation and thought for other advanced TBCs.

**Keywords** TBCs, lanthanum zirconate, thermal conductivity, failure behavior, TGO

## Reference

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