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ARC-HEATING TEST SIMULATION METHOD OF ENGINE THERMAL BARRIER COATING
(TBC) MATERIALS WITH HIGH-EMISSIVITY REAR COATING**Abstract**

Thermal Barrier Coating (TBC) has been widely used in the thermal protection structural components of aero-engine. If the rear surface radiative energy of TBC has been increased by spraying the high radiative coating with the thickness of tens of microns, the TBC will be used in higher temperature range in aero-engine or Scramjet wall material field. In this paper, the inner flow thermal environment of engine has been simulated by the arc-heater double-models rectangle turbulent flow duct technique, and the improved model installation method, which can provide open-type environment with room temperature in the material rear, can make sure that the rear coating of material can radiated energy to the atmosphere or wall with room temperature. The heat transfer environment of TBC materials with high-emissivity rear coating has been simulated by this method, and the thermal protection performance has been tested. The type-K thermocouples and single-wavelength infrared thermometer were used to measure the high-emissivity rear coating temperature. According to the rear temperatures measured by the two kinds of instruments, the spectral emissivity vs. temperature curve can be found. The results show that the rear temperature of thermal protection materials with high-emissivity rear coating is lower 81.1K than that without high-emissivity rear coating. The spectral emissivity of high-emissivity rear coating $\varepsilon_\lambda(\lambda=1.6\mu\text{m})$ is 0.89 to 0.77 for the temperature range from 1103K to 1153K, and ε_λ decreases when the temperature increases.