

THE MODIFICATION OF RARE EARTH YB DOPED YTTRIUM ALUMINUM GARNET CERAMIC THERMAL PROTECTIVE COATING MATERIAL

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The development of a new generation of ultra-high temperature thermal protection coatings will be an urgent requirement for the rapid development of aerospace. The yttrium aluminum garnet ceramics with high melting point, high strength and excellent high temperature stability will be a potential high temperature coating candidate material. However, its high conductivity will limit its use as a coating material. For the issue of heat insulation poor in yttrium aluminum garnet ceramic, the design and modification on ceramic materials were researched. The results have shown that it doesn't change the YAG crystal structure and keep the original garnet crystal structure that the rare earth Yb doped YAG ceramic, yttrium aluminum garnet. The grain microstructure in YAG was significantly refined and the porosity was increased. The porosity increases with the increase of doping rare earth Yb in YAG. Obviously the specific heat capacity was reduced with the doping of the rare earth Yb in YAG, as so to reduce thermal conductivity of YAG. When the doping amount was up to 0.9, the grain size was small at 1.2-1.5um and the thermal diffusion and thermal conductivity were the lowest in YAG. Meanwhile, the thermal expansion coefficient of YAG ceramics was little variation and the phase change has not taken place with rare earth Yb doping in YAG. So there were excellent thermal expansion matching properties and good structure stability in the rare earth Yb doped yttrium aluminum garnet ceramic.