



162162

IMPROVED PLASMA SPRAYED THERMAL BOND COAT SYSTEM



ABSTRACT

G00002

A method for forming a thermal barrier coating system (20) on an article subjected to a hostile thermal environment, such as the hot gas path components of a gas turbine engine. The coating system (20) is generally comprised of a ceramic layer (26) and an environmentally resistant beta phase nickel aluminum intermetallic (β -NiAl) bond coat (24) that adheres the ceramic layer (26) to the component surface. A thin aluminum oxide scale (28) forms on the surface of the β -NiAl during heat treatment. An additional layer of diffusion aluminide may be formed underlying the ceramic layer (26). The β -NiAl may contain alloying elements in addition to nickel and aluminum in order to increase the environmental resistance of the β -NiAl. These elements include hafnium, chromium and zirconium and increase the oxidation resistance of the β -NiAl. The β -NiAl is supplied as a powder having a size in the range of 20-50 microns. The β -NiAl powder is applied using air plasma spray techniques to produce a surface having a roughness of 400 microinches or rougher. The ceramic top coat (26), a stabilized zirconia, typically yttria-stabilized zirconia, can be applied using inexpensive thermal spray techniques to greater thicknesses than achievable otherwise because of the rough surface finish of the underlying β -NiAl bond coat (24). Alternatively, the β -NiAl coat (24) can be used as an environmental coating without application of an overlying ceramic topcoat (26).

Figure 2