

THERMAL BARRIER COATINGS WITH LOWER POROSITY FOR IMPROVED IMPACT AND EROSION RESISTANCE

ABSTRACT

A reduced thermal conductivity thermal barrier coating (22) having improved impact and erosion resistance for an underlying metal substrate (14) of articles (10) that operate at, or are exposed to, high temperatures. This coating (22) comprises a zirconia-containing ceramic composition having a c/a ratio in the range of from 1.0057 to 1.0123 and stabilized in the tetragonal phase by a stabilizing amount of a stabilizing metal oxide. The coating (22) has a fraction of porosity of from 0.15 to 0.25, and at least one impact and erosion resistance property defined by the following formulas: (a) $I = \exp. [5.85 - (144 \times s) - (3.68 \times p)]$; and/or; (b) $E = [187 - (261 \times p) - (9989 \times s)]$, wherein $s = 1.0117 - c/a$ ratio; p is the fraction of porosity; I is least 70 g/mil; and E is least 80 g/mil. This coating (22) can be used to provide a thermally protected article (10) having a metal substrate (14) and optionally a bond coat layer (18) adjacent to and overlaying the metal substrate (14). The thermal barrier coating (22) can be prepared by depositing the zirconia-containing ceramic composition on the bond coat layer (18), or the metal substrate (14) in the absence of the bond coat layer (18).

(FIG. 1)