

OR2607

## High temperature fatigue of free-standing CoNiCrAlY sprayed coatings

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Thermal barrier coatings (TBCs) have been used in turbine blades and combustors to degrade the temperature of superalloy substrates. The TBC system consists of a TBC and an oxidation-resistant coating to protect a substrate from oxidation and corrosion. MCrAlY, M is Co and/or Ni, is usually employed for the oxidation-resistant coating. The MCrAlY coatings are also employed as bondcoats in order to promote the adhesion of TBCs. The mechanical property of a MCrAlY coating influences the initiation of cracks in the superalloy substrate under thermo-mechanical fatigue conditions. It is important to know the fatigue properties of free-standing coatings themselves. Lateral compression of a circular tube specimen is a convenient method for evaluating the mechanical properties of free-standing coatings. This method does not need chucking and manufacturing the free-standing coating is quite straight forward. In this study, fatigue tests of the free-standing CoNiCrAlY coatings prepared using high-velocity-oxyfuel (HVOF) spraying were conducted with the lateral compression method at room temperature, 200 °C and 520 °C. As-sprayed coatings and the coatings with post-spray thermal treatment at 1050 °C were prepared. The thickness of the free-standing coatings were approximately 0.3mm. Test results showed that the post-spray treatment was effective in increasing both the monotonic strength and fatigue life. The fatigue life at 520 °C was shorter than that at room temperature in the case of the coating with post-spray treatment at 1050 °C. On the contrary, in the case of as-sprayed coating under a low stress condition, the fatigue life at high temperature was found not to be shorter than that at room temperature. It was found that the fatigue life of the as-sprayed coating was enhanced by the high temperature during the fatigue test similarly to the post-spray treatment.

### Keywords

Fatigue

Thermal barrier coating

MCrAlY

High velocity oxyfuel(HVOF)

Bending