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NASA TECH BRIEF

Lewis Research Center

Advanced Protective Coating for Superalloys

A new coating has been developed which results in a superior oxidation protection for nickel-base alloys at temperatures up to 1367 K (2000°F). The coating is a cobalt-base alloy containing the following weight percent composition: 25 chromium, 14 aluminum and 0.5 yttrium. The unique features of this coating result in part from the coating application process (overlay coating) in that the deposition of the protective surface alloy layer does not depend on aluminum reaction with the superalloy substrate to form aluminides, as is the case for the more conventional coatings. This new coating was specifically developed to protect the high strength nickel alloy NASA TRW-VIA (described in NASA Tech Brief 68-10344). The coating was applied in a vacuum by electron beam physical vapor deposition to a thickness range of 76 to 127 μm (0.003 to 0.005 inch). After passing ballistic impact tests and oxidation tests in a static air furnace for 200 hours at 1367 K (2000°F), the coating resisted burner rig oxidation testing in the combustion products of JP-5 fuel and air at 1367 K (2000°F) for 1100 hours without failure. This life is three times as much as that displayed by specimens coated with an aluminide now in engine service. Limited mechanical test results indicate that the coating does not adversely affect the tensile and stress rupture properties of the substrate nickel-base superalloy.

Notes:

1. The following documentation may be obtained from:
   National Technical Information Service
   Springfield, Virginia 22151
   Single document price $3.00
   (or microfiche $0.95)
   Reference: NASA CR-72813 (N70-17669)
   Evaluation of Advanced Superalloy Protection Systems

2. Technical questions may be directed to:
   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135
   Reference: B72-10150

Patent status:

No patent action is contemplated by NASA

Source: F. P. Talboom, R. C. Elam and L. W. Wilson of Pratt and Whitney under contract to Lewis Research Center (LEW-11473)

Category 04