Coatings containing silicon on advanced titanium alloys.

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Abstract

Advanced titanium alloys based on γ-TiAl and α_2-Ti_3Al draw attention as lightweight structural materials in aircraft and automotive industry. However, their insufficient resistance to hot corrosion calls for development of appropriate protection systems. It is expected that silicon-containing coatings will provide a satisfactory protection, since SiO_2 is known for thermodynamic stability in hot-salt environments.

In this work, a silicon-containing coating was deposited on a Ti-46Al-8Ta (at%) alloy in a two-step process, comprising physical and chemical vapour deposition. The as-received coating was adherent and its thickness was about 40 μm. To evaluate protective properties of the coating, the samples were contaminated with a mixture of NaCl and Na_2SO_4 in a mass ratio of 1:3 and oxidized in thermal cycling conditions in air at 800^{o}C. Reaction progress was followed by thermogravimetric measurements. Significant improvement in hot corrosion resistance was noted for the coated samples compared with the uncoated reference. The post-exposure examination included scanning electron microscopy (SEM) with energy dispersive X-ray analysis (EDS/EDAX) and X-ray diffraction (XRD) .

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