

论文

TiAl合金表面抗高温氧化涂层研究

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摘要:

研究了TiAl合金表面双层辉光离子渗Cr层、等离子喷涂以及激光重熔MCrAlY涂层在850℃的循环氧化行为。用扫描电镜(SEM)、能谱仪(EDS)、辉光放电光谱分析仪(GDS)和X射线衍射仪(XRD)分析了涂层氧化前后的表面形貌、微观组织和相组成。结果表明,渗Cr层组织均匀、致密,且与TiAl合金基体为梯度冶金结合;经过激光重熔处理后,等离子喷涂MCrAlY层的片层状组织得以消失,致密性提高;几种涂层均不同程度地提高了TiAl合金的抗高温氧化性能,其中渗Cr层在氧化初期表现出较好的抗氧化性能,但在长期循环氧化过程中存在局部氧化层剥落现象,等离子喷涂MCrAlY层能显著提高TiAl合金的抗高温氧化性能,经过激光重熔后可进一步提高其抗高温氧化性能。

关键词: TiAl合金 双层辉光离子渗Cr 激光重熔 等离子喷涂 MCrAlY涂层 抗高温氧化性能

HIGH-TEMPERATURE OXIDATION RESISTANCE COATINGS ON TiAl ALLOY SURFACE

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Abstract:

The behaviours of double glow plasma surface chromized layers, plasma-sprayed and laser--remelted MCrAlY coatings on the cyclic oxidation resistance of a TiAl alloy were researched in air at 850 °C. The surface morphology, microstructure and phases of the coatings before and after oxidation were investigated using scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS), glow discharge spectrometer (GDS) and X-ray diffractometry (XRD). The results show that the chromized layer was uniform, dense and had a well gradient metallurgical bonding with TiAl substrate. The MCrAlY coating prepared by plasma-spraying had a higher porosity and showed lamellar structure, which were eliminated after laser remelting. All the coatings improved the oxidation resistance of TiAl alloy very effectively. The chromized layer showed good oxidation resistance in the early stage of oxidation, while the oxide scale partially peels off in the long--term cyclic oxidation process. The MCrAlY coatings had better oxidation resistance during the long-term cyclic oxidation process. The plasma-sprayed MCrAlY coating had better oxidation resistance than the TiAl alloy, and the laser-remelted coating had the best oxidation resistance among the coatings.

Keywords: TiAl alloy double glow plasma surface chromizing laser remelting plasma spraying MCrAlY coating high-temperature oxidation resistance

收稿日期 2008-07-28 修回日期 2008-11-10 网络版发布日期 2009-02-19

DOI:

基金项目:

国家自然科学基金资助项目(59975046);江苏省自然科学基金重点资助项目(BK2004005)

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