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Microstructure and oxidation resistance of MCrAlY coatings by arc ion platingQian Shi¹, Songsheng Lin², Huijun Hou², Mingjiang Dai², Fang Hu³, Chunbei Wei³¹Guangdong Institute of New Materials, Guangzhou, China ²National Engineering Laboratory for Modern Materials Surface Engineering Technology, Guangzhou, China³The Key Lab of Guangdong for Modern Materials Surface Engineering Technology, Guangzhou, China

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MCrAlY (where M=Ni, Co, or NiCo) coatings are commonly used to protect high temperature components in aeroengines due to their good adhesion, high modulus, good hot corrosion protection and high temperature oxidation resistance. Vacuum heat treatments are necessary for application. However, the influence of substrate chemical composition should not be ignored. In this study, the NiCrAlY coatings were prepared on Ni-based superalloys by arc ion plating. Vacuum heat treatments were carried out to promote inter-diffusion between the coating and the substrate. The phases and microstructures of the coatings before and after vacuum heat treatment were characterized by X-ray diffraction, scanning electron microscopy, energy dispersive spectroscopy. The relationship between coating properties and oxidation was analyzed. The results show that the density of coatings was improved and Ni-rich phase inter-diffusion layer formed after proper heat treatment. The composition changes with depth from the surface of the coatings to substrate. The coatings show mass gains of only about 0.165 mg/cm² after 100h oxidation at 1050 °C, which is excellent than Ni-based super-alloys.

Keywords

MCrAlY coatings
high temperature oxidation
arc ion plating
vacuum heat treatment
inter-diffusion