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Microstructure and high temperature reciprocating sliding wear properties of $MoSi_2$/TiC/γ-Ni composite coating in-situ synthesized by co-axial powder feeding plasma transferred arc cladding

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Abstract:

A $MoSi_2$/TiC/γ-Ni high temperature wear-resistant composite coating was in-situ synthesized on AISI 321 substrate by co-axial powder feeding plasma transferred arc (PTA) cladding process using powders blend of Ni, Ti, Mo, Si and Ni-P coated graphite as raw material. Microstructure and in-situ synthesis mechanism of the composite coating was analyzed. High temperature tribological properties of the coating were evaluated. Test results show that the composite coating has refined microstructure consisting of $MoSi_2$, TiC and γ-Ni. TiC and $MoSi_2$ as in-situ synthesized reinforcing phases are uniformly scattered in the γ-Ni/TiC binary eutectic matrix. Benefiting from the unique microstructure, the coating exhibits high hardness, low and stable friction coefficient values and good high temperature reciprocating sliding wear resistance.

Keyword: Plasma transferred arc cladding; In-situ synthesis; Composite coating; Reciprocating sliding wear.

1. Introduction

AISI 321 as a typical austenitic stainless steel is widely used in chemical, petrochemical, nuclear reactor and other corrosive conditions owing to its exceptional corrosion resistance. However, with low hardness and an austenitic structure which means it cannot be hardened by heat treatment, tribological properties of AISI 321 are very poor. The poor tribological properties severely prevent AISI 321 from being applied in aggressive wear conditions [1,2]. Since wear starts from the surface of the

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