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### Ru过渡层对NiCoCrAlY涂层与DD6单晶高温合金界面扩散行为的影响

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### Impact of Ru Buffer Layer on Diffusion Behavior Between NiCoCrAlY and Single Crystal Superalloy DD6

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摘要

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**摘要** 针对第二代单晶高温合金DD6开展了一种具有阻扩散功能的金属防护涂层的探索性研究。采用电镀和电子束物理气相沉积(EB-PVD)方法在DD6单晶高温合金上制备了NiCoCrAlY/Ru双层结构涂层,同时采用EB-PVD在单晶合金上沉积了单层NiCoCrAlY涂层。研究表明,在1050℃大气环境中扩散处理300h后,涂覆单一NiCoCrAlY涂层的单晶高温合金基体中析出了厚度约为55μm的互扩散区(IDZ)以及厚度达25μm的二次反应区(SRZ)。与单一的NiCoCrAlY涂层相比,NiCoCrAlY/Ru涂覆的合金基体中只有少量的拓扑密堆相(TCP)析出。NiCoCrAlY/Ru双层结构涂层减缓了涂层中的Al元素的内扩散,有效地抑制了基体SRZ的形成。

**关键词:** 电子束物理气相沉积 单晶高温合金 涂层 二次反应区 拓扑密堆相 互扩散

**Abstract:** In this paper, a metallic protective coating is investigated as a diffusion barrier on the second generation single crystal superalloy DD6. A double layer of NiCoCrAlY/Ru coating is prepared by electroplating and electron beam physical vapor deposition (EB-PVD) on a sample of single crystal superalloy DD6. Also, a single NiCoCrAlY coating is deposited onto the single crystal superalloy by EB-PVD. The results show that an interdiffusion zone (IDZ) of ~55 μm and a secondary reaction zone (SRZ) of ~25 μm are formed in the superalloy after 300 h heat-treatment at 1050 °C in atmospheric environment. Compared with the single NiCoCrAlY coating, the NiCoCrAlY/Ru coating effectively suppressed the formation of SRZ in the superalloy. There are only tiny amounts of topologically close-packed phases (TCP) precipitated in the superalloy.

**Keywords:** electron beam physical vapor deposition single crystal superalloy coating secondary reaction zone topologically close-packed phase interdiffusion

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