

论文

热等静压和热处理对快凝NiAl--Cr(Mo)--Hf共晶合金显微组织和压缩性能的影响

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摘要:

快速凝固可明显细化NiAl-Cr(Mo)-0.5Hf共晶合金的组织, 使合金中的富Hf相部分以 Hf固溶体的形式存在, 改善了Heusler相(Ni₂AlHf)和Hf固溶体的形态和分布, 明显提高了合金的室温压缩性能. 快凝合金热等静压或高温热处理后, 合金中的Heusler相进一步向Hf固溶体转变, 而且Heusler相和Hf固溶体均由原来的近连续分布转变为不连续分布; 热等静压处理快凝合金中的初生NiAl相呈现粗化的趋势, 而高温热处理快凝合金中的初生NiAl相有所减少. 热等静压和高温热处理工艺进一步改善了快凝合金的高温压缩性能.

关键词: NiAl-Cr(Mo)-Hf共晶合金 快速凝固 热等静压 微观组织 力学性能

EFFECTS OF HIP AND HEAT TREATMENT ON MICROSTRUCTURE AND COMPRESSIVE PROPERTIES OF RAPIDLY SOLIDIFIED NiAl-Cr(Mo)-Hf EUTECTIC ALLOY

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Abstract:

The NiAl-Cr(Mo) eutectic alloy has better fracture toughness and high temperature strength among NiAl alloys. Hf addition can raise the high temperature strength of NiAl-Cr(Mo) eutectic alloy further, but decreases its room temperature compressive properties obviously, which is caused by the microsegregation of Heusler phases. The NiAl-Cr(Mo)-0.5Hf alloy was rapidly solidified and then hot isostatic pressed (HIP) or high temperature treated (HTT) in order to improve the structure and property of this eutectic alloy. The results reveal that rapid solidification can well refine the microstructure of eutectic alloy and keep more amount of Hf solid solution phase in the alloy. Simultaneously, the shapes and distributions of the Heusler (Ni₂AlHf) phases and Hf solid solution phases are well improved. After the HIP treatment, more Heusler phases are transformed into Hf solid solution phases, and the distributions of Heusler phases and Hf solid solution phases become homogeneous, and moreover the primary NiAl phases become coarsening obviously. After HTT, the amount of primary NiAl phases decreases a little, the Heusler phases and Hf solid solution phases become finer. The rapid solidification improves the room temperature compressive properties of the alloy significantly, the HIP and HTT improve its high temperature compressive properties further.

Keywords: NiAl-Cr(Mo)-Hf eutectic alloy rapid solidification hot isostatic pressing (HIP) microstructure mechanical property

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