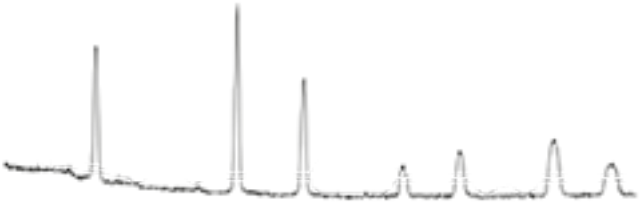

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Microstructure and texture evolution for high-temperature α phase in extruded β-containing TiAl alloy

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Increasing demands on modern turbines require (α2+γ) lamellar-structured TiAl alloys with fine colony size and properly aligned lamellae. As the lamellar structure is formed by the α→α2+γ phase transformation obeying Blackburn OR, the characteristics of lamellar structure depends directly on the high-temperature α phase. Thus, the lamellar structure optimization could be realized by the modification of high-temperature α phase through thermomechanical processing. In this work, the microstructure and texture evolution of high-temperature α phase in TNM alloy during hot extrusion at (α+β) phase field was investigated by high energy X-ray diffraction (HEXRD) and SEM electron back scatter diffraction (SEM-EBSD). Results show that with a small extrusion ratio (E2.25), the microstructure exhibits uniform and equiaxed α grains with a weak ⟨112 $\bar{0}$⟩//ED fiber texture. With the increase of extrusion ratio, the microstructure tends to exhibit bimodal structure (E7.11) consisting of deformed grains, fine primary DRXed grains with ⟨10$\bar{1}$0⟩//ED, as well as coarse grown grains with ⟨11$\bar{2}$0⟩//ED. The microstructure and texture evolution are resulted from a combination of extrusion parameter and the GB β phase. The increasing extrusion ratio, on one hand, increases the deformation degree and the extrusion rate, so that the considerable stored energy cannot be released in a short time. On the other hand, the large extrusion ratio elongates the GB β phase leading to more α/β interfaces which served as pining points inhibited the low-angle boundaries to evolve into high-angle boundaries. Both of them keep more deformed α grains orientated with ⟨10$\bar{1}$0⟩//ED retained in the sample with high extrusion ratio. Accordingly, a preferred grain growth happened to the <11-20>-orientated grains due to the high interface energy.
Keywords: TiAl alloy, extrusion, texture, high energy X-ray diffraction (HEXRD), SEM-EBSD

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