
Texturization of α phase in gamma-TiAl alloy by high temperature compression studied by synchrotron radiation diffraction and EBSD

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Abstract

The third generation β -solidifying TNM alloys with ($\alpha_2+\gamma$) lamellar microstructures have been considered as excellent candidates for modern turbine blades owing to their low density, high specific strength and stiffness, excellent creep resistance, and good corrosion resistance. It has been proved that orienting the γ lamellae to the direction of the load can significantly increase the mechanical properties of the alloys, thus making lamella orientation control (texturization) an interesting topic for property optimization. To achieve this, texturation of the alpha phase via plastic deformation in the α phase zone to, in turn, align the γ lamellae through the α to γ transformation under the Black Burn orientation relationship could be an effect method to realize lamellar orientation control.

Thus, in this work, samples from a TNM alloy were prepared and compressed at 1280°C (having the maximum amount of α phase) under different strain rates to different strains and quenched to room temperature. The textures obtained from the different deformation conditions were measured and analyzed from macroscopic scale by high-energy synchrotron radiation diffraction experiments at HEMS, DESY to mesoscale by EBSD measurements at LEM3, Metz. Results show that the α texture is deformation condition dependent. An optimum basal fiber texture can be obtained under specific deformation conditions for the alpha phase which is optimum for the ($\alpha_2+\gamma$) lamella alignment.

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