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ZrTiAlV alloy grain refining under high-pressure torsion and electric field-assisted heat treatment

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Abstract: To reduce grain size, shorten heat treatment time, and guarantee good comprehensive mechanical properties of ZrTiAlV alloy, we proposed a grain refining technology, which is a combination of electric field-assisted heat treatment and high-pressure torsion. And using this technology we studied ZrTiAlV alloy grain refining. The original material consists of pure phase α, which will be changed into pure phase β at temperatures exceeding 700 °C during electric field-assisted heat treatment. The temperature required for the phase α of the high-pressure torsion material to be completely changed into phase β increases obviously. When the torsion pressure is 5 GPa, the initial heat treatment temperature is higher than 700 °C and the final heat treatment temperature reaches 800 °C, only then can the phase α be completely changed into a phase β structure. When the initial heat treatment temperature is higher than 600 °C, the large grains of phase β contain a large amount

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