EFFECT OF VAR PROCESSING PARAMETERS FOR TI-1023 ALLOY MACROSEGREGATION

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The airscape of WST

Certificate by IOS9001 and AS9100
City wall, 1000 years old
Introduction

Near β-titanium alloy has good elevated temperature properties and resistance to oxidation.

Ti-1023 (Ti-10V-3Fe-2Al) alloy is a typical near β-titanium alloy. It is widely used in aerospace applications.
Experiment

Processing Chart

VAR Processing Parameters

Electrode Prepare → Triple VAR → Ti-1023 Bars → Forging
WHY?

Macro segregation of Fe(β speckle)

Positive segregation element

Key Factor: To finer crystal of ingot

Melting Current(Fixed) Magnetic Field(Changed)
Result and Discussion

Fe Chemical composition of longitudinal position
Fe Chemical composition of transverse position
The new process makes the fluctuation of Fe element more smaller. The rule of Fe segregation is changed by new process. There are no difference between side and center. The top and middle are also.
The Macrostructure of Different Stirring Current Ingots

Columnar+equiaxed crystal
Grain Size: Big

Equiaxed crystal
Grain Size: Small
The Distribution of Lorentz force (Simulated by Northwestern Polytechnical University)

Normal Process

New Process
New VAR processing can produce very strong rotation for melting bathe. The columnar crystals are broken by lorentz force. The crystals become finer. At same time, the columnar crystals change to equiaxed crystals. The Fe chemical composition become more homogeneous. The $\beta$ speckles are not found in the microstructure of final forging bars.
Thank You for Your Attention!