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Method for preparing TiAl alloy plate by argon atomization in powder metallurgy CN102513537

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- **Abstract:**

(CN102513537)
The invention relates to a method for preparing a TiAl alloy plate by argon atomization in powder metallurgy. The method comprises the following steps of: reducing the content of inclusions in TiAl alloy powders by purity smelting in a cold-wall crucible and high-purity argon atomization; performing hot isostatic pressure compaction on the high-purity prealloy powder which is atomized by pure argon under such conditions that the temperature is 1100 to 1300 DEG C, the pressure is 140 to 200 MPa and the compaction time is 2 to 4 hours; removing coatings of the alloy blank after hot isostatic pressure compaction and then performing surface treatment and coating; heating alloy and rolling at a high temperature; and removing coatings to obtain a powder TiAl alloy plate. The plate has the advantages of uniform deformation, good surface quality, fine and uniform texture, low oxide and impurity contents, small thickness, good overall mechanical property and high quality and reliability. The method solves the key problems in development and application of TiAl alloy powder-metallurgy plates, and provides a technical support for innovation and progress of civil industry and aerospace industry.

Claims

(CN102513537)

1. An argon gas-atomized powder process for preparing TiAl alloy sheet material, characterized in: steps of the method are:

(1) preparing a raw material

TiAl with cold-wall crucible vacuum induction melting argon atomized alloy powder preparation, atomization pressure of 6-9 mpa between, the atomized powder was sieved, TiAl alloy powder having a particle size less than 250 m is obtained as a raw material of a pure, chemical compositions and powder at.% atomic percent are: Al: 45-48%, Cr: 1-10%, Nb: 1-10%, W: 0-1%, B: 0-0.2%, the balance being Ti, in weight percent oxygen content of the powder 0.15%;

(2) preparing a powder envelope

The sheath material is stainless steel, pure titanium or a titanium alloy, machined, welded sheath, baked in an oven after the packet applies an alcohol wash;

(3) vacuum degassing

TiAl alloy powder atomized in a vibrating conditions where the argon gas for heating the vacuum degassing, the degassing process parameter is 400-600 °C, P 10-3Pa, holding 1-12h then the powders were loaded into a stainless steel, pure titanium or a titanium alloy sheath and the heat sealing;

(4) hot isostatic pressing treatment

A sheath material of the sealing hot isostatic pressing treatment after welding, hot isostatic pressing in an argon atmosphere, hot isostatic pressing process are: temperature 1100-1300 °C, pressure 140-200 mpa, time 2-4h:

(5) turning

A method of processing using machines to remove the sheath, the sheath would be removed after hot isostatic pressing of the billet surface finish treatment, surface finish attains 6, blank corner rounding;

(6) hot isostatic press blank sheath

A sheath 304 stainless steel sheet prepared using lathing goes through, the sheath having a thickness of 5-10 mm, the alloy ingot is placed in the center, a layer of insulating material placed between the blank and the envelope, the envelope preferably by tig welding closure;

(7) alloy heat

Under an argon atmosphere to put the sealing post-weld heat treating furnace as a function of the envelope material to open rolling temperature, incubated for 30-40 minutes, tapping rolling;

(8) high-temperature blanket roll

Is rolled on the rolling of the steel is rapidly transferred to, open rolling temperature of 1250-1280 °C, deformation rate 0.1-0 . 3m/min, alloy pass deformation of 5-10%, between passes to the furnace insulation 5-15min, the base of the fire using a rolling method, rolling is complete and the workpiece is placed in the oven, the oven was cooled to 1000 °C, and then remove empty cold;

(9) peeling off the sheath

Using machines processing cut-away sheath, TiAl alloy sheet material to obtain a powder metallurgy.

Method for improving microstructure of casted Ti3Al alloy by hydrogenation-hot isostatic pressing

CN102433525

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- **Abstract:**
  (CN102433525)
  The invention belongs to the technical field of heat treatment and relates to a method for improving a microstructure of a casted Ti3Al alloy by hydrogenation-hot isostatic pressing. The method disclosed by the invention comprises the following steps: 1) performing hot isostatic pressing process treatment on the casted Ti3Al alloy; 2) performing hydrogenation treatment on the Ti3Al alloy after the hot isostatic pressing process treatment; 3) performing solid solution and aging treatment on the Ti3Al after the hydrogenation treatment; and 4) finally performing vacuum annealing treatment. According to the method disclosed by the invention, on the one hand, the hot isostatic pressing process is utilized for repairing holes and other defects in the casted Ti3Al alloy and improving the compactness of the alloy; and on the other hand, reversible alloying action and various phase changes of hydrogen in the casted Ti3Al alloy are further utilized for thinning the microstructure of the casted Ti3Al alloy and making up for adverse effects on the performances of the alloy due to coarse grains. Therefore, the holes, shrink holes and other casting defects of the casted Ti3Al alloy and the problem of a coarse structure can be effectively solved.

Claims

(CN102433525)

1. One hydrogenation-hot isostatic pressing to improve casting Ti3Al alloy microstructure of the method, characterized in: the cast Ti3Al alloy in the hot isostatic pressing furnace for parts thereof hot isostatic pressing treatment, hot isostatic pressing at a temperature of 980-1050 °C, hot isostatic pressing time is from 1-4h, a pressure of 110-150 mpa; a hot isostatic pressing after casting of the Ti3Al carbide element then washed with acetone, placed in a tube disposed within the hydrogen furnace, the furnace was evacuated to 10-3Pa, and the furnace temperature was raised to 700-850 °C, insulation 15min, in accordance with the weight percent of the contents of the furnace is charged 1-1.2% of hydrogen, was purged with hydrogen flow of 1L/min, incubated for 1-4h, and then the furnace at 3-5 °C/min was cooled to room temperature; will be placed in a heat treatment furnace hydrogenation processed parts, the furnace temperature was raised to 1000-1050 °C, to 30min after the temperature incubation, and then, furnace cooling to 800-850 °C, incubated for 6-8h, air cooled to room temperature; the processed Ti3Al carbide element for blowing sand; the blast-processed part, placed in a vacuum heat treatment furnace, the furnace was evacuated to 10-3Pa, furnace temperature was raised to 700-850 °C, incubated for 8-12 hours, part of the oven was cooled to room temperature, to give a hydrogenation-hot isostatic pressing treatment Ti3Al carbide element.

2. Hydrogenation-hot isostatic pressing to improve casting Ti3Al alloy microstructure of the method according to claim 1, characterized in: hot isostatic pressing at a temperature of 990-1040 °C, hot isostatic pressing time is from 1-4h, a pressure of 110 -140 mpa.

3. Hydrogenation-hot isostatic pressing to improve casting Ti3Al alloy microstructure of the method according to claim 1, characterized in: after a hot isostatic pressing casting of the Ti3Al carbide element then washed with acetone, placed in a tubular disposed within hydrogen furnace, the furnace was evacuated to 10-3Pa, and the furnace temperature was raised to 730-820 °C, insulation 15min, in accordance with the weight percent of components in the furnace is charged 1-1.2% of hydrogen, was purged with hydrogen flow of 1L/min, incubated for 1-4h, and then the furnace at 3-5 °C/min speed cooled to room temperature.

4. Hydrogenation-hot isostatic pressing to improve casting Ti3Al alloy microstructure of the method according to claim 1, characterized in: after the hydrogenation process will be placed in a heat treatment furnace parts thereof, the furnace temperature was raised to 1010-1050 °C, to 30min after the temperature incubation, and then, furnace cooling to 800-850 °C, incubated for 6-8h, air cooled to room temperature.

5. Hydrogenation-hot isostatic pressing to improve casting Ti3Al alloy microstructure of the method according to claim 1, characterized in: after the blast processing parts thereof, placed in a vacuum heat treatment furnace, the furnace was evacuated to 10-3Pa, the furnace temperature is raised to 710-840 °C, insulation 8-12 hours, part of the oven was cooled to room temperature.

Intermediate layer for brazing connection of Ti3Al-based alloy and high-temperature alloy honeycomb structure

CN103173657

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- **Abstract:**
  (CN103173657)
  The invention discloses an intermediate layer for brazing connection of Ti3Al-based alloy and high-temperature alloy honeycomb structure. The intermediate layer is characterized in that the intermediate layer adopts one of the following alloy materials: (1) nickel-titanium alloy: the chemical compositions of the nickel-titanium alloy and the atomic fraction ratios thereof are as follows: 45-55% of nickel, and the balance of titanium; and (2) nickel-titanium-niobium alloy: the chemical compositions of the nickel-titanium-niobium alloy and the atomic fraction ratios thereof are as follows: 45-50% of nickel, 5-15% of niobium, and the balance of titanium; the thickness of the intermediate layer is 0.05-2.0 mm; and the intermediate layer is placed in an Ti3Al-based alloy for brazing connection on high-temperature alloy honeycombs. According to the technical scheme of the invention, the problems of boundary corrosion, cracks and insufficient joint strength and the like caused when the two kinds of materials are brazed by using traditional brazing filler metals are solved, and a situation that a brazing joint can be running for a long time at a temperature of 650 DEG C is ensured.

Claims

(CN103173657)

1. One Ti3Al-based alloy with high-temperature alloy honeycomb brazed connection with the intermediate layer, characterized in: using an alloy material is one of the following intervening layer:

(1) nickel-titanium alloy, nickel-titanium alloy which is a ratio of atomic fraction of chemical into well as: nickel 45-55%, the balance being titanium;

(2) a nickel-titanium-niobium alloys, nickel-titanium-niobium alloy has a chemical into a well which is atomic fraction ratio of: nickel 45-50%, niobium 5-15%, the balance being titanium;

The intermediate layer has a thickness of 0.05 mm -2.0 mm;

The intermediate layer disposed Ti3Al-based alloy with high-temperature brazing alloy between cells is connected.