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Aqueous Mn Nb novel high - TiAl intermetallic compound material and its preparation method

CN103820677

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- Abstract:
  (CN103820677)
  The invention provides a novel Mn-contained beta-gamma TiAl intermetallic compound material with high Nb content and a preparation method thereof, and belongs to an intermetallic compound material. The novel Mn-contained beta-gamma TiAl intermetallic compound material with the high Nb content comprises elements in a mole percentage as follows: 43%-45% of Al, 5%-15% of Nb, not higher than 1% of Mn and the balance of Ti and inevitable impurities. According to composition, the raw materials are subjected to briquetting forming by a metal briquetting machine, and a briquette comprise a titanium sponge layer, a high-purity aluminum layer, an aluminum and Nb intermediate alloy layer, an electrolytic manganese layer and a titanium sponge layer from bottom to top respectively; the briquette is placed in a water-cooling copper crucible vacuum induction suspension melting furnace, vacuum pumping is performed, smelting power is increased at a speed of 20-30 kW/min until the smelting power is increased to 160-180 kW, then smelting is performed under the constant power to obtain melts, and the melts are mixed uniformly; and the melts are cast into a preheated metal casting mold which centrifugally rotates, and are subjected to furnace cooling. Therefore, the TiAl alloy with high Nb content is obtained, is uniform and small in structure and has no obvious segregation.

Claims

(CN103820677)

1. One containing high Mn Nb model - TiAl intermetallic compound material, characterized in, its element content in mole percent: 43%-45% of the Al, 5-15% of the Nb, not more than 1% Mn and the balance of Ti and inevitable that an impurity.
2. According to one containing high Mn Nb model - TiAl intermetallic compound material according to claim 1, characterized in, 8% Nb content in mole percent, the mole percent of Mn is not more than 1%.
3. According to one containing high Mn Nb model - TiAl intermetallic compound material according to claim 1, characterized in, 8% Nb content in mole percent, the mole percent of Mn 0.1-1%.
4. Novel high Mn-containing Nb - TiAl intermetallic compound was prepared, characterized in, including the steps of:
(1), the following raw materials were weighed: titanium sponge, high purity aluminum, aluminum and niobium master alloy and electrolytic manganese tablets; wherein control Al, Nb, Mn and a Ti element has a mole percent content of 43%-45% of the Al, 5-15% of the Nb, Mn and the balance of Ti is not more than 1% of the together with an impurity;
(2), the step (1) mentioned above may be performed by the press molding metal raw material compacts, the compacts of the various layers are titanium sponge layer from bottom to top, a high-purity aluminum layer, aluminum and niobium master alloy layer, and a titanium sponge layer electrolytic manganese sheet;
(3), the step (2) can be obtained by a water-cooled copper crucible to compacts into a centrifugal casting in a vacuum induction suspension smelting furnace, melting ofthenniernulsion metal mold preheated to 300-400 °C, water-cooled copper crucible vacuum induction melting furnace was evacuated to 1.0-3.0x10-3mbar, to 20-30 kw/min increase rate water-cooled copper crucible vacuum induction melting furnace power will be raised to 160-180 kw is stopped after increasing the power, and then the melting at a constant power 200-250s resulting melt, the melt is evenly mixed;
(4), the melt is cast into a preheated and centrifugation of the rotating metal mold, high-niobium ingot having Mn intermetallic compound TiAl alloy layer is formed, and then furnace cooled.
5. In accordance with the method according to claim 4, characterized in, water-cooled copper crucible 25 kw/min increase rate in the vacuum induction melting suspension smelting furnace will power up to 160-180 kw and performing centrifugal casting molding.
6. In accordance with the method according to claim 4, characterized in, centrifuge rotation speed preferably is 120r/min.
7. In accordance with the method according to claim 4, characterized in, (1) having a purity of 99.7% of the mass of titanium sponge, having a purity of 99.99% by mass of the high-purity aluminum, aluminum and niobium having a purity of 99.8% by mass of the master alloy, the mass of the electrolytic manganese tablets having a purity of 99.99%.

One of Cr, V phase solidifies alloyed with high Nb-TiAl alloy and its preparation method

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- **Abstract:**
  (CN103820676)
  The invention relates to a Cr and V alloying beta phase solidifying high Nb-TiAl alloy and a preparation method thereof, and belongs to the field of alloy technology. The alloy comprises the following elements by mole: 43%-45% of Al, 5%-15% of Nb, less than or equal to 0.5% of Cr, less than or equal to 0.5% of V, and the balance of Ti and inevitable impurities. The preparation method comprises the following steps: raw materials are subjected to briquetting forming according to constitutions, titanium sponges are placed on the edge of the inner side of a mould when briquetting is conducted, a high purity aluminium layer, an aluminium niobium intermediate alloy layer, an electrolytic chromium piece layer, an aluminium vanadium intermediate alloy layer and a titanium sponge layer are arranged from bottom to top in a layering manner; pressing cakes are placed into a water-cooling copper crucible vacuum induction suspension smelting furnace capable of centrifugal pressure casting for vacuum smelting to obtain melts and the melts are enabled to be mixed uniformly; the melts are cast in a metal casting mould that is preheated in advance and centrifugally rotates for centrifugal rotating and casting and cooled with the furnace. According to the invention, a TiAl alloy that is homogeneous and fine in structure and has no obvious segregation is obtained.

Claims

(CN103820676)

1. One of Cr, V phase solidifies alloyed high Nb-TiAl alloy, characterized in, elemental content in mole percent: 43%-45% of the Al, 5-15% of the Nb, not more than 0.5% of the Cr, 0.5% V and the balance of Ti is not more than that and the incidental impurities.
2. According to one Cr according to claim 1, V phase solidifies alloyed high Nb-TiAl alloy, characterized in, 8% Nb content in mole percent, no more than 0.5% Cr content in mole percent, the mole percent of V is not higher than 0.5%.
3. According to one Cr according to claim 1, V phase solidifies alloyed high Nb-TiAl alloy, characterized in, 8% Nb content in mole percent, the mole percent of Cr 0.1-0.5%, the mole percent of V is not higher than 0.5%.
4. According to one Cr according to claim 1, V phase solidifies alloyed high Nb-TiAl alloy, characterized in, 8% Nb content in mole percent, the mole percent of Cr 0.1-0.5%, the mole percent of V 0.1-0.5%.
5. Cr, V phase solidifies alloyed high Nb-TiAl alloy preparation method, characterized in, comprises the steps of:
(1), the following raw materials were weighed: titanium sponge, high purity aluminum, aluminum and niobium master alloy, aluminum v electrolytic chrome pads and the intermediate alloy; wherein control Al, Nb, Cr, V and a Ti element has a mole percent content of 43%-45% of the Al, 5-15% of the Nb, not more than 0.5% of the Cr, V and a balance of Ti 0.5% of the no more than incidental impurities as well as;
(2), the step (1) mentioned above may be carried out by molding raw material metal briquetting machine compacts, the compacts at first when the sponge titanium placed inside edges of the mold, and then the high-purity aluminum layer inside the area encompassed by layering from bottom to top sponge titanium, aluminum and niobium master alloy layer, electrolytic chrome sheet, aluminum v intermediate alloy layer and a titanium sponge layer;
(3) the step (2) can be obtained by a water-cooled copper crucible to compacts into a centrifugal casting in a vacuum induction suspension smelting furnace, melting the metal mold before the mold is preheated to 300-400 °C, water-cooled copper crucible vacuum induction melting furnace chamber was evacuated to 1.0-3.0x10-3mbar, to 20-30 kw/min increase rate water-cooled copper crucible vacuum induction melting furnace power will be raised to 160-180 kw is stopped after increasing the power, and then the melting at a constant power 200-300s resulting melt, the melt is evenly mixed;
(4) the step (3) of the melt was cast into a preheated casting mold where good and centrifugal rotating metal, forming Cr, V phase solidifies alloyed high Nb-TiAl alloy ingot, and then furnace cooled.
6. In accordance with the method according to claim 5, characterized in, water-cooled copper crucible to 20 kw/min increase rate of the suspension smelting furnace in a vacuum induction melting power was raised to 160-180 kw and performing centrifugal casting molding.
7. In accordance with the method according to claim 5, characterized in, centrifuge rotation speed preferably is 120r/min.
8. In accordance with the method according to claim 5, characterized in, (1) in the mass of sponge titanium having a purity of 99.78%, purity of 99.99% by mass of the high-purity aluminum, aluminum and niobium having a purity of 99.86% quality of the master alloy, having a purity of 99.99% by mass of the electrolytic chrome, aluminum v the quality of the master alloy having a purity of 99.6%.

Preparation method of shell mold for investment casting of TiAl based alloy
CN102601307

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• **Fampat family**

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• **Abstract:**

(CN102601307)

The invention relates to a preparation method of a shell mold for investment casting of a TiAl based alloy, and belongs to the technical field of precision casting. The preparation method comprises the following steps that: firstly, ZrO_2 and zirconia sol are prepared into a slurry; after the slurry is coated with a wax pattern, ZrO_2 sand with a particle degree of 120 to 180 meshes is spread; Al_2O_3 and ethyl silicate hydrolyzate are prepared into a slurry, and then after the slurry is coated with a mold shell, Al_2O_3 sand with a particle degree of 60 to 90 meshes is spread, the slurry coating and the sand spreading are repeated for several times, the sand is Al_2O_3 sand with the particle degree of 40 to 50, 20 to 30, and 6 to 10 meshes sequentially, and drying is carried out; and dewaxing and roasting are carried out. The preparation method has the advantages that: the strength of the mold shell is sufficient, the production cycle is short, the quality of the inner surface of the mold shell is good, the reaction between TiAl based alloy castings and the mold shell is small after casting, and the castings have high surface quality.

Claims

(CN102601307)

1. TiAl-based alloy investment casting shell mold of one production method, characterized in, comprises the following steps:

1) a particle size of 300-400 purpose ZrO_2 powder and the zirconia sol was 2.5 g/ml in a powder-liquid ratio: 1-3.5: 1 configured to room temperature, flow cup viscosity of 40-55-second slurry;

2) the slurry was applied to the wax model, scattered particle size of 120-180 purpose ZrO_2 sand, dried; using 800-1100 purpose Al_2O_3 ethyl silicate hydrolyzed solution at a weight ratio of sand to 2.2: 1-2.4: 1 configured to room temperature, flow cup viscosity of 35-55-second slurry, 2nd layer coated, sprinkled sand particle size of 60-90 purpose Al_2O_3 sand, dry ammonia, drying;

3) followed by coating step 2) of the slurry, and then sprinkled particle size of 30-50 purpose Al_2O_3 sand, sequentially repeating coating slurry and sanding, preparing a 3rd-4 layer, dry ammonia, drying; followed by recoating steps 2) slurry, scattered particle size of 16-25 purpose Al_2O_3 coating is hung, and sequentially repeating the coating slurry and sanding preparing a 5th-7 layer, dry ammonia, drying; final coating step 2) of the slurry, and spread out 6-10 purpose Al_2O_3 sand production of the final layer, immersion strengtheners, dried;

4) de-waxing, sintering.

2. In accordance with the method according to claim 1, characterized in Al_2O_3 to pass through the electro fusion of calcined Al_2O_3, ethyl silicate hydrolyzed solution is in component is tetraethyl orthosilicate, water, anhydrous ethanol, hydrochloric acid and a mixture of boric acid, in an amount relationship is tetraethyl orthosilicate ml: ml water: ml absolute ethanol: g concentrated hydrochloric acid: boric acid was g (800-1200): (150-180): (600-650): (8-10): (3-4); enhancer component is tetraethyl orthosilicate, water, a mixture of ethanol and hydrochloric acid anhydrous, in an amount relationship is tetraethyl orthosilicate ml: ml water: ml absolute ethanol: concentrated hydrochloric acid was g (800-1200): (150-180): (600-650): (4-6).

3. In accordance with the method according to claim 1, characterized in, step 1) are also added during the preparation of slurry wetting agent, an antifoaming agent, wherein the weight percent of total slurry wetting agent in an amount of 1-3 ‰, defoamers of total paste weight percentage is between 3-5 ‰, wherein the humectant is n-octanol; edge stir zirconium sol while the ZrO_2 powder was added, and then sequentially added wetting agents, defoamers, stirred for 2 hours or more, 12 hours after coating may be placed.

4. In accordance with the method according to claim 1, characterized in, step 2) and a 3) of the specific steps of: a wax model into the slurry, soaking 5-10 seconds, so as to uniformly cover type wax model rotates during coating, the suspended wax model is removed after 3-5 seconds, run off excess paint, scattered particle size of 120-180 mesh number ZrO_2 sand, at a temperature of 25-27 °C, humidity of 50-70% under an environment 12 hours or longer to dry, forming the facing sheet; with 800-1100 light mesh Al_2O_3 ethyl silicate hydrolyzed solution at a weight ratio of sand to 2.2: 1-2.4: 1 configured to room temperature, flow cup viscosity of 35-55-second slurry, 2nd layer coating is hung, the same way as the 1st layer coated, sprinkled particle size of 60-90 purpose Al_2O_3 sand, at a temperature of 25-27 °C, humidity of 50-70% of the ambient air dried for 15-30 minutes, and then the shell mold placed in a closed environment, placed aqueous ammonia, aqueous ammonia having a concentration of 40%, by ammonia dry 15-45 minutes, in order to make mold-fast hardening; ammonia has dried, and then placed at a temperature of 25-27 °C, humidity of 50-70% of the ventilated environment was dried for 15-20 minutes; then produced in the same manner, coated 800-1100 purpose Al_2O_3 with ethyl silicate hydrolyzate slurry consisting of sand, scattered particle size of 35-45 purpose Al_2O_3 sand coated hung 3rd-4 layer, drying, dry ammonia, drying; scattered particle size of 20-30 purpose Al_2O_3 coating hung 5th-7 layer, drying, dry ammonia, and then dried; finally scattered particle size of 6-10 purposes of calcined electrofused Al_2O_3 sand, dried, ammonia dry, soaked in the shell mold then takes in the strengtheners 2-3 minutes, in the open air discharge 7-12 hours.

5. In accordance with the method according to claim 4, characterized in, dry ammonia, per $1m^3$ corresponding enclosed environment 10 ml aqueous ammonia.

6. In accordance with the method according to claim 1, characterized in, step 3), de-waxing or warm water vapor dew shell mold after the placed 1-2 hours followed by sintering, the sintering process is heated to 400-500 °C insulation 1-1.5 hours, further heated to 700-800 °C insulation 1-1.5 hours, and finally heated to 900-1100 °C insulation 1-2 hours, cooled to room temperature can be taken out.

V and Mn alloyed beta-phase solidified high Nb-TiAl alloy and preparation method thereof

CN103834844

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- **Fampat family**

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- **Abstract:**
  (CN103834844)
  The invention discloses V and Mn alloyed beta-phase solidified high Nb-TiAl alloy and a preparation method thereof, and belongs to the technical field of alloys. The alloy consists of the following elements in percentage by mole: 43-45% of Al, 5-15% of Nb, V being no higher than 0.5%, Mn being no higher than 1.0%, and the balance of Ti and inevitable impurities. The preparation method comprises the steps of briquetting raw materials according to the composition, meanwhile placing sponge titanium on the edge of inner side of a mold, and then placing a high-purity aluminum layer, an aluminum-niobium intermediate alloy layer, an electrolytic manganese flake layer, an aluminum-vanadium intermediate alloy layer and a sponge titanium layer from bottom to top in a layered mode; placing briquette in a water-cooling copper crucible vacuum induction levitation melting furnace which can be subjected to centrifugal pressure casting, vacuumizing and melting to obtain melt, and uniformly mixing the melt; and casting the melt into a preheated and centrifugal rotating metal cast mold to centrifugally rotate and cast the melt, and cooling the melt along with the furnace. The TiAl alloy disclosed by the invention is uniform and small in structure and free from obvious segregation.

Claims

(CN103834844)

1. One of V, Mn alloying phase solidifies high Nb-TiAl alloy, characterized in, elemental content in mole percent: 43%-45% of the Al, 5-15% of the Nb, not more than 0.5% of the V, Mn of not more than 1.0% of the incidental impurities and the balance Ti and an.
2. In accordance with one V according to claim 1, alloyed Mn phase solidifies high Nb-TiAl alloy, characterized in, 8% Nb content in mole percent, no more than 0.5% V content in mole percent, the mole percent of Mn is not more than 1.0%.
3. In accordance with one V according to claim 1, alloyed Mn phase solidifies high Nb-TiAl alloy, characterized in, 8% Nb content in mole percent, the mole percent of V 0.1-0.5%, the mole percent of Mn is not more than 1.0%.
4. In accordance with one V according to claim 1, alloyed Mn phase solidifies high Nb-TiAl alloy, characterized in, 8% Nb content in mole percent, the mole percent of V 0.1-0.5%, the mole percent of Mn 0.1-1.0%.
5. V, Mn alloying phase solidifies high Nb-TiAl alloy preparation method, characterized in, including the steps of:
(1), the following raw materials were weighed: titanium sponge, high purity aluminum, aluminum and niobium master alloy, aluminum v electrolytic manganese tablets and the master alloy; wherein control Al, Nb, V, Mn and a Ti element has a mole percent content of 43%-45% of the Al, 5-15% of the Nb, not more than 0.5% of the V, Mn of not more than 1.0% of the incidental impurities and the balance being Ti as well as;
(2), the step (1) mentioned above may be carried out by metal briquette press molding raw material compacts, the compacts at first when the sponge titanium placed inside edges of the mold, and then the high-purity aluminum layer inside the area encompassed by layering from bottom to top sponge titanium, aluminum and niobium master alloy layer, electrolytic manganese sheet, aluminum v intermediate alloy layer and a titanium sponge layer;
(3) the step (2) the resulting compacts into a water-cooled copper crucible vacuum induction to the centrifugal casting suspension smelting furnace, melting the metal casting mold prior to pre-heated to 300-350 °C, water-cooled copper crucible vacuum induction melting furnace chamber was evacuated to 1.0-3.0x10-3mbar, to 20-30 kw/min increase rate water-cooled copper crucible vacuum induction melting furnace power will be raised to 160-170 kw is stopped after increasing the power, and then the melting at a constant power 200-250s resulting melt, the melt is evenly mixed;
(4) the step (3) of the melt was cast into a preheated casting mold where good and centrifugal rotating metal, forming a V, Mn alloying phase solidifies high Nb-TiAl alloy ingot, and then furnace cooled.
6. In accordance with the method according to claim 5, characterized in, water-cooled copper crucible to 20 kw/min increase rate vacuum induction melting suspension smelting furnace will power up to 160-170 kw and performing centrifugal casting molding.
7. In accordance with the method according to claim 5, characterized in, centrifuge rotation speed preferably is 120r/min.
8. In accordance with the method according to claim 5, characterized in, (1) in the mass of sponge titanium having a purity of 99.78%, purity of 99.99% by mass of the high-purity aluminum, aluminum and niobium having a purity of 99.86% quality of the master alloy, having a purity of 99.99% quality of electrolytic manganese tablets, the quality of the master alloy aluminum v having a purity of 99.6%.

Cr and Mn alloying beta phase solidifying high Nb-TiAl alloy and preparation method thereof

CN103820672

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• **Abstract:**
(CN103820672)
The invention relates to a Cr and Mn alloying beta phase solidifying high Nb-TiAl alloy and a preparation method thereof, and belongs to the field of alloy technology. The alloy comprises the following elements by mole: 43%-45% of Al, 5%-15% of Nb, less than or equal to 0.5% of Cr, less than or equal to 1% of Mn, and the balance of Ti and inevitable impurities. The preparation method comprises the following steps: raw materials are subjected to briquetting forming according to constitutions, titanium sponges are placed on the edge of the inner side of a mould firstly, a high purity aluminium layer, and an aluminium niobium intermediate alloy layer, an electrolytic manganese piece layer, an electrolytic chromium piece layer and a titanium sponge layer are arranged from bottom to top respectively; pressing cakes are placed into a water-cooling copper crucible vacuum induction suspension smelting furnace capable of centrifugal pressure casting for vacuum smelting to obtain melts and the melts are enabled to be mixed uniformly; the melts are cast in a metal casting mould that is preheated in advance and centrifugally rotates for centrifugal rotating and casting and cooled with the furnace. According to the invention, a TiAl alloy that is homogeneous and fine in structure and has no obvious segregation is obtained.

Claims

(CN103820672)

1. One of Cr, Mn alloying phase solidifies high Nb-TiAl alloy, characterized in, elemental content in mole percent: 43%-45% of the Al, 5-15% of the Nb, not more than 0.5% of the Cr, Mn and the balance of Ti is not more than 1% of the incidental impurities as well.

2. According to one Cr according to claim 1, alloyed Mn phase solidifies high Nb-TiAl alloy, characterized in, 8% Nb content in mole percent, no more than 0.5% Cr content in mole percent, the mole percent of Mn is not more than 1%.

3. According to one Cr according to claim 1, alloyed Mn phase solidifies high Nb-TiAl alloy, characterized in, 8% Nb content in mole percent, the mole percent of Cr 0.1-0.5%, the mole percent of Mn is not more than 1%.

4. According to one Cr according to claim 1, alloyed Mn phase solidifies high Nb-TiAl alloy, characterized in, 8% Nb content in mole percent, the mole percent of Cr 0.1-0.5%, the mole percent of Mn 0.1-1%.

5. Cr, Mn alloying phase solidifies high Nb-TiAl alloy preparation method, characterized in, comprises the steps of:

(1), the following raw materials were weighed: titanium sponge, high purity aluminum, aluminum and niobium master alloy, electrolytic chrome pads and electrolytic manganese tablets; wherein control Al, Nb, Cr, Mn and a Ti element has a mole percent content of 43%-45% of the Al, 5-15% of the Nb, not more than 0.5% of the Cr, Mn of not more than 1% of the Ti and inevitable impurities and balance;

(2), the step (1) mentioned above may be carried out by molding raw material metal briquetting machine compacts, the compacts at first when the sponge titanium placed inside edges around the mold, and then the titanium sponge placed inside a region enclosed by the layers from bottom to top respectively to a high purity aluminum layer, aluminum and niobium master alloy layer, electrolytic manganese sheet, electrolytic chrome sheet and a titanium sponge layer;

(3) the step (2) can be obtained by a water-cooled copper crucible to compacts into a centrifugal casting in a vacuum induction suspension smelting furnace, melting the metal mold before the mold is preheated to 300-400 °C, water-cooled copper crucible vacuum induction melting furnace chamber was evacuated to 1.0-3.0x10-3mbar, to 20-30 kw/min increase rate of the water-cooled copper crucible vacuum induction melting furnace power rises 160-180 kw is stopped after increasing the power, and then the melting at a constant power 200-300s resulting melt, the melt is evenly mixed;

(4) the step (3) of the melt was cast into a preheated casting mold where good and centrifugal rotating metal, forming Cr, Mn alloying phase solidifies high Nb-TiAl alloy ingot, and then furnace cooled.

6. In accordance with the method according to claim 5, characterized in, water-cooled copper crucible to 20 kw/min increase rate of the suspension smelting furnace in a vacuum induction power was raised to 160-180 kw and performing centrifugal casting molding.

7. In accordance with the method according to claim 5, characterized in, centrifuge rotation speed preferably is 120r/min.

8. In accordance with the method according to claim 5, characterized in, (1) in the mass of sponge titanium having a purity of 99.78%, purity of 99.99% by mass of the high-purity aluminum, aluminum and niobium having a purity of 99.86% quality of the master alloy, having a purity of 99.99% by mass of the electrolytic chrome, electrolytic manganese tablets having a purity of the quality of 99.99%.

Novel V-contained beta-gamma TiAl intermetallic compound material with high Nb content and preparation method thereof

CN103820675

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- **Abstract:**

(CN103820675)
The invention provides a novel V-contained beta-gamma TiAl intermetallic compound material with high Nb content and a preparation method thereof, and belongs to an intermetallic compound material. The novel V-contained beta-gamma TiAl intermetallic compound material with the high Nb content comprises elements in a mole percentage as follows: 43%-45% of Al, 5%-15% of Nb, not higher than 1% of V and the balance of Ti and inevitable impurities. According to composition, the raw materials are subjected to briquetting forming by a metal briquetting machine, a briquette comprises a titanium sponge layer, a high-purity aluminum layer, an aluminum and Nb intermediate alloy layer, an aluminum and V intermediate alloy layer and a titanium sponge layer from bottom to top respectively; the briquette is placed in a water-cooling copper crucible vacuum induction suspension melting furnace, vacuum pumping is performed, smelting power is increased at a speed of 20-30 kW/min until the smelting power is increased to 160-180 kW, then smelting is performed under the constant power to obtain melts, and the melts are mixed uniformly; and the melts are cast into a preheated metal casting mold which centrifugally rotates, and are subjected to furnace cooling. Therefore, the TiAl alloy with high Nb content is obtained, is uniform and small in structure and has no obvious segregation.

Claims

(CN103820675)

1. One containing high V Nb model - TiAl intermetallic compound material, characterized in, its element content in mole percent: 43%-45% of the Al, 5-15% of the Nb, V and the balance of Ti and a 1% to not more than incidental impurities.
2. According to one containing high V Nb model - TiAl intermetallic compound material according to claim 1, characterized in, 8% Nb content in mole percent, the mole percent of V is not higher than 1%.
3. According to one containing high V Nb model - TiAl intermetallic compound material according to claim 1, characterized in, 8% Nb content in mole percent, the mole percent of V 0.1-1%.
4. V high Nb model containing - TiAl intermetallic compound was prepared, characterized in, comprises the steps of:
(1), the following raw materials were weighed: titanium sponge, high purity aluminum, aluminum and niobium master alloy and aluminum v master alloy; wherein control Al, Nb, V and a Ti element has a mole percent content of 43%-45% of the Al, 5-15% of the Nb, not more than 1% V and the balance Ti and impurities of the;
(2), the step (1) mentioned above may be carried out by a metal raw material briquette press molded compact, a compact is from top to bottom the layers are titanium sponge layer, a high-purity aluminum layer, aluminum and niobium master alloy layer, aluminum v intermediate alloy layer and a titanium sponge layer;
(3), the step (2) the resulting compacts into a water-cooled copper crucible vacuum induction to the centrifugal casting of the suspension smelting furnace, melting ofthenniernulsion metal mold preheated to 300-400 °C, water-cooled copper crucible vacuum induction melting furnace was evacuated to 1.0-3.0x10-3mbar, to 20-30 kw/min increase rate water-cooled copper crucible vacuum induction melting furnace power will be raised to 160-180 kw is stopped after increasing the power, and then the melting at a constant power 200-300s resulting melt, the melt is evenly mixed;
(4), the melt is cast into a preheated and centrifugation of the rotating metal mold, TiAl intermetallic compound containing formation V high-niobium ingot, and then furnace cooled.
5. In accordance with the method according to claim 4, characterized in, water-cooled copper crucible to 30 kw/min increase rate of the suspension smelting furnace in a vacuum induction power was raised to 160-180 kw and performing centrifugal casting molding.
6. In accordance with the method according to claim 4, characterized in, centrifuge rotation speed preferably is 140r/min.
7. In accordance with the method according to claim 4, characterized in, (1) having a purity of 99.7% of the mass of sponge titanium, high-purity aluminum having a purity of 99.99% of the mass, having a purity of 99.8% quality of the master alloy aluminum and niobium, aluminum v the quality of the master alloy having a purity of 99.6%.

W and V alloying beta phase solidifying high Nb-TiAl alloy and preparation method thereof

CN103820673

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- **Fampat family**

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- **Abstract:**
  (CN103820673)
  The invention relates to a W and V alloying beta phase solidifying high Nb-TiAl alloy and a preparation method thereof, and belongs to the field of alloy technology. The alloy comprises the following elements by mole: 43%-45% of Al, 5%-15% of Nb, less than or equal to 0.4% of W, less than or equal to 0.5% of V, and the balance of Ti and inevitable impurities. The preparation method comprises the following steps: raw materials are subjected to briquetting forming according to constitutions, titanium sponges are placed on the edge of the inner side of a mould firstly, a high purity aluminium layer, an aluminium niobium intermediate alloy layer, an aluminium vanadium intermediated alloy layer, an aluminium tungsten niobium intermediate alloy layer and a titanium sponge layer are arranged from bottom to top respectively; pressing cakes are placed into a water-cooling copper crucible vacuum induction suspension smelting furnace capable of centrifugal pressure casting for vacuum smelting to obtain melts and the melts are enabled to be mixed uniformly; the melts are cast in a metal casting mould that is preheated in advance and centrifugally rotates for centrifugal rotating and casting and cooled with the furnace. According to the invention, a TiAl alloy that is homogeneous and fine in structure and has no obvious segregation is obtained.

Claims

(CN103820673)

1. One of W, V phase solidifies alloyed high Nb-TiAl alloy, characterized in, elemental content in mole percent: 43%-45% of the Al, 5-15% of the Nb, not more than 0.4% of the W, V and the balance of Ti is not more than 0.5% of the incidental impurities as well.

2. According to one W according to claim 1, V phase solidifies alloyed high Nb-TiAl alloy, characterized in, 8% Nb content in mole percent, the mole percent of W is not more than 0.4%, the mole percent of V is not higher than 0.5%.

3. According to one W according to claim 1, V phase solidifies alloyed high Nb-TiAl alloy, characterized in, 8% Nb content in mole percent, the mole percent of W 0.1-0.4%, the mole percent of V is not higher than 0.5%.

4. According to one W according to claim 1, V phase solidifies alloyed high Nb-TiAl alloy, characterized in, 8% Nb content in mole percent, the mole percent of W 0.1-0.4%, the mole percent of V 0.1-0.5%.

5. W, V phase solidifies alloyed high Nb-TiAl alloy preparation method, characterized in, comprises the steps of:

(1), the following raw materials were weighed: titanium sponge, high purity aluminum, aluminum and niobium master alloy, aluminum tungsten, niobium master alloy and aluminum v master alloy; wherein control Al, Nb, W, V and a Ti element has a mole percent content of 43%-45% of the Al, 5-15% of the Nb, not more than 0.4% of the W, V and the balance is not higher than 0.5% of the Ti and inevitable impurities;

(2), the step (1) mentioned above may be carried out by molding raw material metal briquetting machine compacts, the compacts at first when the sponge titanium placed inside edges around the mold, and then the titanium sponge regions surrounded by the layers from bottom to top to bottom respectively high-purity aluminum layer placed, aluminum and niobium master alloy layer, aluminum v master alloy layer, the intermediate alloy layer and aluminum tungsten, niobium titanium sponge layer;

(3) the step (2) the resulting compacts into a water-cooled copper crucible vacuum induction to the centrifugal casting of the suspension smelting furnace, melting the metal mold before the mold is preheated to 300-500 °C, water-cooled copper crucible vacuum induction melting furnace chamber was evacuated to 1.0-3.0x10-3mbar, to 20-30 kw/min increase rate water-cooled copper crucible vacuum induction melting furnace power will be raised to 160-180 kw is stopped after increasing the power, and then the melting at a constant power 200-3000s resulting melt, the melt is evenly mixed;

(4) the step (3) of the melt was cast into a preheated casting mold where good and centrifugal rotating metal, forming a W, V phase solidifies alloyed high Nb-TiAl alloy ingot, and then furnace cooled.

6. In accordance with the method according to claim 5, characterized in, water-cooled copper crucible to 20 kw/min increase rate of the suspension smelting furnace in a vacuum induction melting power was raised to 160-180 kw and performing centrifugal casting molding.

7. In accordance with the method according to claim 5, characterized in, centrifuge rotation speed preferably is 140r/min.

8. In accordance with the method according to claim 5, characterized in, (1) in the mass of sponge titanium having a purity of 99.78%, purity of 99.99% by mass of the high-purity aluminum, aluminum and niobium having a purity of 99.86% quality of the master alloy, the quality of the master alloy having a purity of 99.69% aluminum tungsten, niobium, aluminum v the quality of the master alloy having a purity of 99.6%.

W and Mn alloying beta phase solidifying high Nb-TiAl alloy and preparation method thereof

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- **Fampat family**

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- **Abstract:**
  (CN103820674)
  The invention relates to a W and Mn alloying beta phase solidifying high Nb-TiAl alloy and a preparation method thereof, and belongs to the field of alloy technology. The alloy comprises the following elements by mole: 43%-45% of Al, 5%-15% of Nb, less than or equal to 0.4% of W, less than or equal to 1% of Mn, and the balance of Ti and inevitable impurities. The preparation method comprises the following steps: raw materials are subjected to briquetting forming according to constitutions, titanium sponges are placed on the edge of the inner side of a mould firstly, a high purity aluminium layer, an aluminium niobium intermediate alloy layer, an electrolytic manganese piece layer, an aluminium tungsten niobium intermediate alloy layer and a titanium sponge layer are arranged from bottom to top respectively; pressing cakes are placed into a water-cooling copper crucible vacuum induction suspension smelting furnace capable of centrifugal pressure casting for vacuum smelting to obtain melts, and the melts are enabled to be mixed uniformly; the melts are cast in a metal casting mould that is preheated in advance and centrifugally rotates for centrifugal rotating and casting and cooled with the furnace. According to the invention, a TiAl alloy that is homogeneous and fine in structure and has no obvious segregation is obtained.

Claims

(CN103820674)

1. One W, Mn alloying phase solidifies high Nb-TiAl alloy, characterized in, elemental content in mole percent: 43%-45% of the Al, 5-15% of the Nb, not more than 0.4% of the W, Mn of not more than 1% of the incidental impurities and the balance Ti and an.

2. According to one W according to claim 1, alloyed Mn phase solidifies high Nb-TiAl alloy, characterized in, 8% Nb content in mole percent, the mole percent of W is not more than 0.4%, the mole percent of Mn is not more than 1%.

3. According to one W according to claim 1, alloyed Mn phase solidifies high Nb-TiAl alloy, characterized in, 8% Nb content in mole percent, the mole percent of W 0.1-0.4%, the mole percent of Mn is not more than 1%.

4. According to one W according to claim 1, alloyed Mn phase solidifies high Nb-TiAl alloy, characterized in, 8% Nb content in mole percent, the mole percent of W 0.1-0.4%, the mole percent of Mn 0.1-1%.

5. W, Mn alloying phase solidifies high Nb-TiAl alloy preparation method, characterized in, including the steps of:

(1), the following raw materials were weighed: titanium sponge, high purity aluminum, aluminum and niobium master alloy, aluminum tungsten, niobium master alloy and electrolytic manganese tablets; wherein control Al, Nb, W, Mn and a Ti element has a mole percent content of 43%-45% of the Al, 5-15% of the Nb, not more than 0.4% of the W, Mn of not more than 1% of the Ti and inevitable impurities and balance;

(2), the step (1) mentioned above may be carried out by a metal raw material briquette press molded compacts, the compacts at first when the sponge titanium placed inside edges around the mold, and then the bottom regions surrounded by titanium sponge placed respectively to a high purity aluminum layer the layers from bottom to top, aluminum and niobium master alloy layer, electrolytic manganese sheet, aluminum tungsten, niobium master alloy layer and a titanium sponge layer;

(3) the step (2) the resulting compacts into a water-cooled copper crucible vacuum induction to the centrifugal casting of the suspension smelting furnace, melting the metal mold before the mold is preheated to 300-500 °C, water-cooled copper crucible vacuum induction melting furnace chamber was evacuated to 1.0-3.0x10-3mbar, to 20-30 kw/min increase rate water-cooled copper crucible vacuum induction melting furnace power will be raised to 160-180 kw is stopped after increasing the power, and then the melting at a constant power 200-300s resulting melt, the melt is evenly mixed;

(4) the step (3) of the melt was cast into a preheated casting mold where good and centrifugal rotating metal, forming a W, Mn alloying phase solidifies high Nb-TiAl alloy ingot, and then furnace cooled.

6. In accordance with the method according to claim 5, characterized in, water-cooled copper crucible to 20 kw/min increase rate vacuum induction melting suspension smelting furnace will power up to 160-180 kw and performing centrifugal casting molding.

7. In accordance with the method according to claim 5, characterized in, centrifuge rotation speed preferably is 120r/min.

8. In accordance with the method according to claim 5, characterized in, (1) in the mass of sponge titanium having a purity of 99.78%, purity of 99.99% by mass of the high-purity aluminum, aluminum and niobium having a purity of 99.86% quality of the master alloy, aluminum tungsten, niobium having a purity of 99.69% quality of the master alloy, the mass of the electrolytic manganese tablets having a purity of 99.99%.

Multi-alloying beta-phase-solidified high Nb-TiAl alloy and preparation method thereof

CN103820697

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• **Fampat family**

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• **Abstract:**

(CN103820697)

The invention provides a multi-alloying beta-phase-solidified high Nb-TiAl alloy and a preparation method thereof, and belongs to the technical field of alloy. The alloy comprises the following elements in molar percentage: 43-45% of Al, 5-15% of Nb, no greater than 0.2% of W, no greater than 0.5% of Cr, and the balance of Ti and inevitable impurities; raw materials are formed by briquetting according to the ratio; firstly, a titanium sponge is placed on the inner edge of a mold; secondly, a high pure aluminium layer, an aluminium niobium middle alloy layer, an electrolyzed chromium piece, an aluminium tungsten niobium middle alloy layer, and a titanium sponge layer are arranged sequentially from the bottom up respectively; the briquetting is placed a water cooled copper crucible vacuum induction suspend smelting furnace capable of realizing centrifugal casting; the melt is obtained through smelting under vacuuming, and is mixed uniformly; the melt is cast into a metal mold which is preheated and perform centrifugal rotation for performing centrifugal rotation,, and is cooled along with the furnace. According to the method, the uniform fine TiAl alloy without obvious segregation is obtained.

Claims

(CN103820697)

1. A poly--phase coagulation high alloyed Nb-TiAl alloy, characterized in, elemental content in mole percent: 43%-45% of the Al, 5-15% of the Nb, not more than 0.2% of the W, Cr and the balance of Ti is not more than 0.5% of the incidental impurities as well.
2. According to a multi-alloyed high phase solidifies Nb-TiAl alloy according to claim 1, characterized in, 8% Nb content in mole percent, the mole percent of W is not more than 0.2%, the mole percent of Cr is not more than 0.5%.
3. The multivalent alloying phase solidifies high Nb-TiAl alloy preparation method, characterized in, comprises the steps of:
(1), the following raw materials were weighed: titanium sponge, high purity aluminum, aluminum and niobium master alloy, aluminum tungsten, niobium master alloy and electrolytic chrome pads; wherein control Al, Nb, W, Cr and the Ti element has a mole percent content of 43%-45% of the Al, 5-15% of the Nb, not more than 0.2% of the W, Cr and the balance is not higher than 0.5% of the Ti and inevitable impurities;
(2), the step (1) mentioned above may be carried out by metal briquette press molding raw material compacts, the compacts at first when the sponge titanium placed inside edges around the mold, and then the area encompassed by titanium sponge to a high purity aluminum layer from bottom to top layers respectively having bottom, aluminum and niobium master alloy layer, electrolytic chrome, aluminum tungsten, niobium master alloy layer and a titanium sponge layer;
(3) the step (2) a water-cooled casting can be obtained compacts into a copper crucible vacuum induction centrifugated to the suspension smelting furnace, melting metal casting mold preheated to ofthenniernulsion 300-500 °C, water-cooled copper crucible vacuum induction melting furnace chamber was evacuated to 1.0-2.0x10-3mbar, to 5-10 kw/min increase rate water-cooled copper crucible vacuum induction melting furnace power will be raised to 160-180 kw is stopped after increasing the power, and then the melting at a constant power 120-240s resulting melt, the melt is evenly mixed;
(4) the step (3) of the melt was cast into a preheated casting mold where good and centrifugal rotating metal, phase solidifies to form the multivalent alloyed high Nb-TiAl alloy ingot, and then furnace cooled.
4. In accordance with the method according to claim 3, characterized in, water-cooled copper crucible to 10 kw/min increase rate of the suspension smelting furnace in a vacuum induction melting power was raised to 160-180 kw and performing centrifugal casting molding.
5. In accordance with the method according to claim 3, characterized in, centrifuge rotation speed preferably is 120r/min.
6. In accordance with the method according to claim 3, characterized in, (1) in the mass of sponge titanium having a purity of 99.78%, purity of 99.99% by mass of the high-purity aluminum, aluminum and niobium having a purity of 99.86% quality of the master alloy, aluminum tungsten, niobium having a purity of 99.69% quality of the master alloy, the mass of the electrolytic chrome pads having a purity of 99.99%.

Novel beta-gamma TiAl intermetallic compound material containing Cr and high Nb content and preparation method of material

CN103710606

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- **Priority Details**
  2013CN-0688069 2013-12-16

- **Fampat family**
  CN103710606 A 2014-04-09 [CN103710606]

- **Abstract:**
  (CN103710606)
  The invention provides a novel beta-gamma TiAl intermetallic compound material containing Cr and high Nb content and a preparation method of the material, and belongs to the intermetallic compound materials. The intermetallic compound material comprises the following elements by mole percent: 43 to 45% of Al, 5 to 15% of Nb, not greater than 0.4% of Cr, the balance of Ti and inevitable impurities. The preparation method comprises the following steps of processing the raw materials by briquetting and molding through a metal briquetting machine according to the composition to obtain a titanium sponge layer, a high-purity aluminum layer, an aluminum niobium intermediate alloy layer, an electrolytic chromium sheet layer and another titanium sponge layer which are respectively arranged from bottom to top; transferring the briquettes into a water-cooled copper crucible vacuum induction suspension smelting furnace; vacuumizing; raising the melting power to be 140 to 160kw at rate of 10 to 15kw/min; then stopping raising the power; melting under a constant power; uniformly mixing melts; pouring the melts into a preheated metal mould; centrifugally rotating; and cooling along with the furnace. With the adoption of the preparation method, a uniform and small beta phase containing gamma-TiAl alloy structure can be obtained; the beta phase containing gamma-TiAl alloy structure has no obvious segregation.

Claims

(CN103710606)

1. One containing high Cr Nb model - TiAl intermetallic compound material, characterized in, its element content in mole percent: 43%-45% of the Al, 5-15% of the Nb, Cr and the balance of Ti is not more than 0.4% of the incidental impurities as well.

2. According to one containing high Cr Nb model - TiAl intermetallic compound material according to claim 1, characterized in, Nb content in mole percent 8-10%, the mole percent of Cr is not more than 0.4%.

3. According to one containing high Cr Nb model - TiAl intermetallic compound material according to claim 1, characterized in, 8% Nb content in mole percent, the mole percent of Cr 0.2%.

4. High Cr-containing Nb model - TiAl intermetallic compound was prepared, characterized in, comprises the steps of:

(1), the following raw materials were weighed: titanium sponge, high purity aluminum, aluminum and niobium master alloy and electrolytic chrome pads; wherein control Al, Nb, Cr and the Ti element has a mole percent content of 43%-45% of the Al, 5-15% of the Nb, not more than 0.4% Cr and the balance Ti and impurities of the;

(2), the step (1) mentioned above may be carried out by press molding raw material metal briquetting machine, each layer is a titanium sponge layer from bottom to top when the compact, high-purity aluminum layer, aluminum and niobium master alloy layer, electrolytic chrome sheet and a titanium sponge layer;

(3), the step (2) can be obtained compacts into a water-cooled copper crucible to Centrifugal casting vacuum induction suspension smelting furnace, melting ofthenniernulsion metal mold preheated to 300-350 °C, water-cooled copper crucible vacuum induction melting furnace was evacuated to 4.0-6.0x10-3mbar, to 10-15 kw/min increase rate water-cooled copper crucible vacuum induction melting furnace power will be raised to 140-160 kw is stopped after increasing the power, and then the melting at a constant power 120-180s resulting melt, the melt is evenly mixed;

(4), the melt is cast into a preheated and centrifugation of the rotating metal mold, to form a TiAl intermetallic compound containing Cr high-niobium ingot, and then furnace cooled.

5. In accordance with the method according to claim 4, characterized in, water-cooled copper crucible to 10 kw/min increase rate of the suspension smelting furnace in a vacuum induction melting power was raised to 140-160 kw and performing centrifugal casting molding.

6. In accordance with the method according to claim 4, characterized in, centrifuge rotation speed preferably is 150r/min.

7. In accordance with the method according to claim 4, characterized in, (1) having a purity of 99.7% of the mass of sponge titanium, a high-purity aluminum having a purity of 99.99% of the mass, having a purity of 99.8% by mass of the master alloy aluminum and niobium, the mass of the electrolytic chrome pads having a purity of 99.999%.

W-containing and high-Nb novel beta-gammaTiAl intermetallic compound material and preparation method thereof

CN103695708

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- **Priority Details**
  2013CN-0645814 2013-12-04

- **Fampat family**

CN103695708	A	2014-04-02	[CN103695708]

- **Abstract:**
  (CN103695708)
  The invention relates to a W-containing and high-Nb novel beta-gammaTiAl intermetallic compound material and a preparation method thereof and belongs to the intermetallic compound materials. The W-containing and high-Nb novel beta-gammaTiAl intermetallic compound material comprises the following elements according to the mole percentage: 43%-46% of Al, 5-15% of Nb, less than or equal to 0.4% of W and the balance of Ti and inevitable foreign matters. According to the composition, the materials are briquetted and formed by a metal briquetting machine, and all the layers include a spongy titanium layer, a high-purity aluminium layer, an aluminium-niobium intermediate alloy layer, an aluminium-tungsten-niobium intermediate alloy layer and a spongy titanium layer which are arranged from bottom to top. The preparation method comprises the following steps of putting briquettes into a vacuum induction suspended smelting furnace of a water-cooling copper crucible, vacuumizing, increasing the smelting power to 140-160kw at a speed of 5-10kw/min, then stopping power increase, then smelting under constant power to obtain melt, and mixing the melt uniformly; casting the melt into a preheated metal casting mold, carrying out centrifugal rotation on the casting mold and cooling along with the furnace. By adoption of the W-containing and high-Nb novel beta-gammaTiAl intermetallic compound material and the preparation method, a uniform and fine TiAl alloy structure without obvious segregation is obtained.

Claims
(CN103695708)
1. High Nb containing W novel - TiAl intermetallic compound material, characterized in, its element content in mole percent: 43%-46% of the Al, 5-15% of the Nb, not more than 0.4% W and the balance of Ti and inevitable that an impurity.
2. In accordance with one novel Nb containing W high - TiAl intermetallic compound material according to claim 1, characterized in, Nb content in mole percent 8-10%, the mole percent of W is not more than 0.4%.
3. According to one containing high Nb model W - TiAl intermetallic compound material according to claim 1, characterized in, Nb content in mole percent 8-10%, the mole percent of W 0.1-0.4%.
4. High Nb containing W novel - TiAl intermetallic compound was prepared, characterized in, including the steps of:
(1), the following raw materials were weighed: titanium sponge, high purity aluminum, aluminum and niobium master alloy and aluminum tungsten, niobium master alloy; wherein control Al, Nb, W and the Ti element has a mole percent content of 43%-46% of the Al, 5-15% of the Nb, not more than 0.4% W and the balance Ti and impurities of the;
(2), the step (1) mentioned above may be carried out by molding metal raw material briquette press compacts, the compacts when each layer is a titanium sponge layer from bottom to top, a high-purity aluminum layer, aluminum and niobium master alloy layer, the intermediate alloy layer and aluminum tungsten, niobium titanium sponge layer;
(3), the step (2) the resulting compacts into a water-cooled copper crucible vacuum induction to the centrifugal casting of the suspension smelting furnace, melting ofthenniernulsion metal mold preheated to 300-350 °C, water-cooled copper crucible vacuum induction melting furnace was evacuated to 1.0-2.0x10-3mbar, to 8-10 kw/min increase rate water-cooled copper crucible vacuum induction melting furnace power will be raised to 140-160 kw is stopped after increasing the power, and then the melting at a constant power 90-120s resulting melt, the melt is evenly mixed;
(4), the melt is cast into a preheated and centrifugation of the rotating metal mold, to form a TiAl intermetallic compound containing W high-niobium ingot, and then furnace cooled.
5. In accordance with the method according to claim 4, characterized in, water-cooled copper crucible to 10 kw/min increase rate vacuum induction melting suspension smelting furnace will power up to 140-160 kw and performing centrifugal casting molding.
6. In accordance with the method according to claim 4, characterized in, centrifuge rotation speed preferably is 140r/min.
7. In accordance with the method according to claim 4, characterized in, (1) having a purity of 99.7% of the mass of sponge titanium, high-purity aluminum having a purity of 99.99% of the mass, aluminum and niobium having a purity of 99.8% by mass of the master alloy, the quality of the master alloy aluminum tungsten, niobium having a purity of 99.6%.

Er-containing high-niobium Ti-Al intermetallic compound material and preparation method thereof

CN103074520

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- **Priority Details**
  2013CN-0012105 2013-01-14
- **Fampat family**

CN103074520	A	2013-05-01	[CN103074520]

- **Abstract:**
  (CN103074520)
  The invention discloses an Er-containing high- niobium Ti-Al intermetallic compound material and a preparation method thereof, and belongs to intermetallic compound materials. The material is composed of the following elements in mole percent: 41-46 percent of Al, 5-15 percent of niobium, no more than 0.4 percent of Er, and the balance of Ti and unavoidable impurities. The preparation method comprises the following steps: adding titanium sponge, high-purity aluminium, Al- niobium intermediate alloy and Al-Er intermediate alloy into a water cooled copper crucible vacuum induction smelting furnace as per the composition, vacuumizing to 2.0-3.0*10<-3>mbar, rising the smelting power to 160-180 kW at the speed of 5-10 kW/min and stopping at 160-180 kW, smelting for 1-3 minutes at a constant power, obtaining melt, mixing the melt uniformly; and casting the melt into a metal mold preheated to 300-350 DEG C, forming an Er-containing high-niobium Ti-Al intermetallic compound material ingot, and cooling together with the smelting furnace. The method enables the crystal size and layer space of the Ti-Al intermetallic chemical combination to be smaller and thinner.

Claims
(CN103074520)
1. TiAl intermetallic compound material containing Er high-niobium, characterized in, its element content in mole percent: 41%-46% of the Al, 5-15% of the Nb, not more than 0.4% of the Er and the balance of Ti and inevitable impurities.
2. In accordance with TiAl intermetallic compound containing Er high-niobium material according to claim 1, characterized in, Nb content in mole percent 8-10%, the mole percent of Er 0.2%.
3. In accordance with the high-niobium TiAl intermetallic compound containing Er material according to claim 1, characterized in, 8% Nb content in mole percent, the mole percent of Er 0.2%.
4. TiAl intermetallic compound containing Er method for producing a high-niobium, characterized in, comprises the steps of:
(1), the following raw materials were weighed: titanium sponge, high purity aluminum, aluminum and niobium master alloy and al-doped master alloy; wherein control Al, Nb, Er and the Ti element has a mole percent content of 41%-46% of the Al, 5-15% of the Nb, not more than 0.4% of the Ti and impurities and the balance of Er;
(2), the step (1) mentioned above may be added to the water-cooled copper crucible vacuum induction melting raw material layering device implemented, each layer is a titanium sponge layer from bottom to top, a high-purity aluminum layer, aluminum and niobium master alloy layer, the intermediate alloy layer and a titanium sponge layer al-doped; a metal mold preheated to 300-350 °C, water-cooled copper crucible vacuum induction melting furnace chamber was evacuated to 2.0-3.0x10-3mbar, to 5-10 kw/min increase rate water-cooled copper crucible vacuum induction melting furnace power will be raised to 160-180 kw is stopped after increasing the power, and then at a constant power smelting 1-3min resulting melt, the melt is evenly mixed;
(3) a melt was cast into a preheated metal mold, is formed of a TiAl intermetallic compound containing a rare-Er high-niobium ingot, and then furnace cooled.
5. In accordance with the method according to claim 4, characterized in, 10 kw/min increase rate water-cooled copper crucible in a vacuum induction furnace power will be raised to 160-180 kw.

Method for preparing porous heat exchange surface of TiAl-based intermetallic compound

CN102303117

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- **Abstract:**
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  The invention relates to a method for preparing a porous heat exchange surface of a TiAl-based intermetallic compound, and belongs to the technical field of intermetallic compounds. The method comprises the following steps of: (1), mixing 43 to 50 atom percent of Ti powder, 0 to 10 atom percent of Al powder and the balance of Nb powder, and drying the powder to prepare cold spraying powder; (2), polishing and cleaning a metal substrate, and depositing the cold spraying powder on the metal substrate at one time; and (3), performing vacuum heat preservation and sintering by using a three-step sintering process again, and thus preparing a TiAl-based alloy porous layer on the metal substrate. The invention has the advantages that: mixed metal powder can be directly sprayed on the outer surface of a metal plate (pipe), and the method is simple, high in efficiency and suitable for mass production of heat exchange plates (pipes); the prepared TiAl-based porous coating layer has a uniform thickness and uniform pores, and is firm, difficult to fall off, and applicable for plate-type or pipe-type heat exchanges of the fields such as chemical industry, petroleum, metallurgy, sea water desalinization, high-temperature heat exchange and the like.

Claims

(CN102303117)

1. One or titanium-based intermetallic compound method for producing a porous heat exchange surface, characterized in, preparing step comprises:

1) Ti powder will be, Al powder and Nb powder in an atomic percent Ti-(43-50) Al-(0-10) Nb at.% ingredients, and then placed in a V-type blender mixed powders were each 5-8 hours, powders were taken out as cold spray powder after drying;

2) Step 1) placed in the prepared mixed cold spray powder dusting device of the injection molding machine, the pure Ti or TiAl alloy matrix is subjected to polishing, followed by ultrasonic cleaning treatment, and then the cold spray deposited onto the Cold Spray powder pure Ti or TiAl alloy disposable manner on the substrate, cold spray the working temperature was 300-500 °C, sprayed with a nitrogen or argon atmosphere;

3) Step 2) the sample is placed in a vacuum sintering furnace, sintering process using three-stage: 1st stage at 120-150 °C insulation 30-60min, 2nd step was heated to 550-600 °C insulation 120-180min, 3rd step was heated to 1300-1400 °C insulation 180-300min, a sintering process in a vacuum heat insulation, cooling of the oven, in pure Ti, TiAl based intermetallic compound TiAl alloy substrates with a layer of porous coating.

2. Preparation method according to claim 1, characterized in, Ti particles having a particle size of 25 m -150 m, Al powder having a size of 25 m -150 m, particles having a particle size of less than Nb 25 m.

3. Preparation method according to claim 1, characterized in, pure Ti, TiAl alloy substrate 1500# sandpaper to the sanding.

4. Claim 1 or 3 as production method, characterized in, pure Ti or TiAl alloy substrate is a sheet or tubing.

One kind of directional freeze Gao Nitai the preparation method of aluminum alloy CN101875106

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- **Abstract:**
  (CN101875106)
  The invention discloses a preparation method of a directional solidification high-niobium TiAl-base alloy, which belongs to the field of metal material preparation. The high-niobium TiAl-base alloy contains Ti, Al, Nb, W, Mn, C, B and Y, and the atomic percentage is: (43-49) Ti-(45-46) Al-(6-9) Nb-(0-0.5) (W and Mn)-(0-0.5) (C and B)-(0-0.5) Y, an as-cast master alloy rod which is smelted by plasma arc or vacuum suspension is taken as a raw material, a high-purity alumina ceramic tube with a coating layer of which the main component is yttrium oxide is used as a crucible, Ga-In-Sn alloy liquid is cooling liquid, and the directional solidification high-niobium TiAl-base alloy is successfully prepared by using an improved zone-melting and directional solidification system. The processing technology is simple and reliable, the directional solidification effect is obvious, and the method has universal applicability. The directional solidification high-niobium TiAl-base alloy which is prepared by the directional solidification method has comprehensive and good high temperature performance and room temperature ductility and has wide application prospect in terms of high temperature structural materials.

Claims

(CN101875106)

1. A directional solidification process for preparing high niobium titanium aluminum-based alloy, characterized in alloy composition are atomic percent:(43-49)Ti-(45-46)Al-(6-9)Nb-(0-0.5)(W,Mn)-(0-0.5)(C,B)-(0-0.5)Y, production process is:

(1) mother alloy melting: a plasma arc or vacuum induction levitation furnace for melting, and cast into ingots;

(2) preparing high purity alumina ceramic crucible inner wall of the coating, an alumina crucible size of: (7-25) x120mm, a volume percentage of the ingredients of the coating composition: (87-93) +% yttria (2-3) +% phosphate (5-10)% bentonite;

(3) cutting the wire into a cylinder of the as-cast master alloy ((6-20) x100mm) sample, placed in the crucible to the float zone and introduced into the modified directional solidification system, by applying vacuum to 3x10-3Pa, recharged to the system is filled with the highly purified argon to 380Pa, turns on system power is heated, and overcomes the alloy melting point 20-500K is reached, i.e. 1930K-2410K, a heating rate of 15-20K/min, after warm-retaining 15-30 minutes to uniformize sufficiently melted alloy;

(3) start a directional solidification, by directional solidification PLC control panel on the system area with directional solidification rate is 1-100 m/s;

(4) after completion of directional solidification, vented to atmosphere, the crucibles were removed with gentle an outer layer is ceramic scraping, grinding and polishing the surface thereof was removed and high niobium titanium aluminum-based alloy to give a directional solidification.

2. High niobium titanium aluminum-based alloy directional solidification process according to claim 1, characterized in that if necessary, the sample is introduced into the bottom seed, the seed titanium aluminum alloy single crystal claim is rod-shaped, cross-sectional diameter is the same as with the master alloy, high 5-25 mm, with the mother alloy is carried out after welding assembly argon-arc welding bottom ends, followed by a directional solidification process, cut-away after completion of the seed crystal portion where directional solidification.

3. A directional solidification process high niobium titanium aluminum-based alloy according to claim 1, wherein the modified directional solidification after melting into the area of the tungsten-rhenium thermocouple system comprised with (1), the insulating panel (2), high-niobium titanium aluminum alloy (3), a graphite sleeve (4), a high-purity alumina crucible (5), the crucible coating (6), a thermocouple protective sleeve (7), the induction coil (8), a thermally conductive base (9), the heat radiation shield (10), a liquid metal cooled liquid (11), a water cooling system (12) composition; tungsten-rhenium thermocouple and a thermocouple outer protective sleeve, and inserted in the high niobium titanium aluminum alloy stick heart ministry, measuring a high internal temperature Niobium-Titanium aluminum alloy; high purity alumina crucible inner wall coated with an inert coating material body to block the alloy at a high temperature chemically react with the crucible; high purity alumina crucible having a graphite sleeve mounted inside concentric with the inner and maintain position; insulation panel provided on the graphite outer liner, constant-temperature environment within the system ensure that coagulates, causing the columnar crystal along the axial growth; induction coil being positioned in a peripheral thermal insulation board, and the graphite sleeve for inductively heating the interior of the insulation panels; located in the lower portion of the graphite sleeve to prevent the escape of heat radiation radiating heat barrier, retaining the system within a constant-temperature environment and increasing the temperature of the coagulation system and the cooling system to increase the temperature gradient difference; makes contact with the alloy in a directional solidification process of the thermally conductive base bottom ends serve to keep the crucible and the single action of conducting heat, the alloy is solidified in the axial direction; liquid metal coolant to directly cool the heat-conducting base of the crucible, water-cooling system for the coolant to cool the liquid metal.

4. With the directional solidification after melting into the area of the changed system according to claim 3, wherein the single-turn induction coil is changed to the original float zone system multi-turn coil, the induction coil is disposed between the crucible and the graphite sleeve, the effect of shielding magnetic fields on the coagulation process, and through induction coil heating graphite sleeve, provide a stable high-temperature heat source to a high-Titanium aluminum alloy; crucible with a graphite sleeve inner wall from the outer wall 2-3 mm.

5. After melting into the area of the change to the directional solidification system according to claim 3, is characterized in that under conditions of a graphite sleeve shield magnetic field interference, using a tungsten-rhenium thermocouple pair alloy and the melt temperature measurements, controlling the heating rate and the directional solidification front melt superheat.

6. After melting into the area of the change to the directional solidification system according to claim 3, wherein the liquid metal coolant with Ga-In-Sn alloy slurry.