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Method of producing titanium aluminide having superior oxidation resistance

EP-495454

- **Abstract:**

(EP-495454)

Ti powders and AP powders are combined to prepare a mixture of 40 55 at% of AP and the balance of Ti. After CIP and degassing, plastic working by hot extrusion is applied to form a shaped mixture of Ti and AP. The shape is then processed by HIP to synthesize titanium aluminide while diffusing AP into the Ti structure to form an AP₂ O₃ phase occurring from both the reaction between AP and oxygen contained in the Ti structure and the oxides on the AP surface, and to disperse the AP₂ O₃ to form the AP₂ O₃ protective film. With the reaction between AP and oxygen contained in the Ti structure and with the "Pegging" effect, both the AP₂ O₃ phase formed at the grain boundaries of crystals or in the crystal grains of titanium aluminide and the AP₂ O₃ phase existing on the surface of raw material AP powder peg the surface AP₂ O₃ film to the surface of the titanium aluminide body. This "Pegging" effect enhances the adhesiveness of the film and improves the oxidation resistance of titanium aluminide. (see diagramm 1 page 0)

Claims

(EP-495454)

1. Method of producing titanium aluminide having a superior oxidation resistance wherein said method comprises processes of:
(1) Ti powder and AL powders are mixed to prepare a mixture of 40 ~ 55 at% of AL and the balance of Ti;

(2) said prepared mixture is subjected to plastic working to form a Ti-AL shaped mixture;

(3) said mixture shape is subjected to heat treatment in an inert atmosphere at 300 DEG.C or higher to react oxygen with AL by diffusing AL into the Ti structure and to form an AL₂O₃ phase occurring from oxides on the AL powder surface and to disperse said AL₂O₃ phase, followed by compression processing to synthesize titanium aluminide.

2. The method of producing titanium aluminide having a superior oxidation resistance of Claim 1, wherein said Ti powder used in said step (1) is adjusted to contain 0.005 ~ 1 at% of oxygen.

3. The method of producing the titanium aluminide having a superior oxidation resistance of Claim 1, wherein the powder mixture prepared in said process (1) contains one or more of the components selected from the group of 0.5 ~ 5 at% of Mn, V, Cr, Mo, or Nb, 0.1 ~ 3 at% of Si, and 0.01 ~ 5 at% of B.

4. The method of producing the titanium aluminide having a superior oxidation resistance of Claim 1, wherein the heating and compressing processes employed in said process (3) are carried out at a temperature range of 500 to 1,460 DEG.C.

5. The method of producing the titanium aluminide having a superior oxidation resistance of Claim 1, wherein the heating and compressing processes employed in said process (3) are carried out in an HIP (Hot Isostatic Pressure) unit.

6. The method of producing the titanium aluminide having a superior oxidation resistance of Claim 1 or Claim 5, wherein the heating and compressing processes employed in said process (3) are carried out with an HIP unit at a temperature range of 1,200 to 1,400 DEG.C for a retention time ranging from 0.5 to 100 hours.

Production method of high intensity high ductile TiAl based intermetallic JP05017834

- **Abstract:**

(JP05017834)

PURPOSE:To provide a Till intermetallic compound having characteristics combining high strength with high ductility.

CONSTITUTION:The intermetallic compound is characterized by being synthesized from a dense mixture material of Ti and Al by means of reaction sintering, having $\leq 30\mu\text{m}$ average crystalline grain size, and also having a composition consisting of 40-50atomic% Al and the balance Ti. If Mn is incorporated into the above composition by 0.05-10atomic%, the effect of inhibiting pore formation can be produced. By this method, usefulness as a component material for internal combustion engine, etc., can be expected.

Claims

(JP05017834)

Claims machine translated from Japanese

1. From the fine admixture of Ti and Al reaction sintering

By, to be synthesized, average crystal grain size 30 .micro.m or less, component constitution

It features that it consists of remainder Ti with Al40-50at%

High intensity high ductile TiAl based intermetallic.

2. The claim 1 statement which includes Mn0.05-10at%

High intensity high ductile TiAl based intermetallic.

JP04041682





- **Abstract:**
(JP04041682)
PURPOSE: To render high toughness as well as superior strength and heat resistance by coating the surface of the core material of a valve made of titanium aluminide having a specified compsn. with a Ti or Ni shell. CONSTITUTION: The compsn. of the core material of a valve made of titanium aluminide is composed of 25-75atomic% Ti and 25-75atomic% Al. At least part of the surface of the core material is coated with a Ti or Ni shell to obtain a suction and exhaust valve for an internal-combustion engine. A small amt. of one or more among Cr, Mn, V, Co, Zr, Y, Mo, Nb, Hf, Ta, W, Ce, Nd, Si, B, O, C and N may be incorporated into the Al in the compsn. of the core material as required. The pref. thickness of the shell is 0.1-50% of the thickness of the valve head. The durability of the valve can be improved. COPYRIGHT: (C)1992,JPO&Japio

Claims

(JP04041682)

JP15079790 1990-06-08 [1990JP-0150797]

Method for compacting titanium aluminide JP05179301

<ul style="list-style-type: none">• Patent Assignee SUMITOMO LIGHT METAL INDUSTRIES• Inventor KUMAGAI MASAKI SHIBUE KAZUHISA• International Patent Classification B22F-001/00 B22F-003/14 B22F-003/23 C22C-001/04 C23C-010/48	<ul style="list-style-type: none">• Publication Information JPH05179301 A 1993-07-20 [JP05179301]    • Priority Details 1991JP-0359431 1991-12-27
<ul style="list-style-type: none">• Fampat family JPH05179301 A 1993-07-20 [JP05179301]	

- **Abstract:**
(JP05179301)
PURPOSE: To obtain a titanium aluminide compact of intricate shape by combining the mixed powder compacts of Ti and Al (alloy) into the shape resembling the final compact and subjecting the product to HIP. CONSTITUTION: A mixed powder of Ti and Al (alloy) is unidirectionally plastic- worked into a first compact 2 by extrusion, etc. In this case, the powder is elongated in the working direction, and the average diameter of the Al part at right angles to the working direction is controlled to <+60.mu.m. The mixed powder is unidirectionally plastic-worked at the same time to prepare a second compact 3 having the average diameter smaller than that of the Al part of the first compact 2. The compact 3 is mounted on the first compact 2 and subjected to HIP at 750-1450 deg.C and >=30MPa, hence both compacts are joined, and titanium aluminide is obtained.
COPYRIGHT: (C)1993,JPO&Japio

Claims

(JP05179301)

Claims machine translated from Japanese

1. Ti and mixed powder of Al or Al alloy

A which plasticity it processes unidirectionally, with process direction in perpendicular direction

The peripheral section of the 1st compact which designates the average diameter of the I section as 60 .micro.m or less

Plasticity processing similarly unidirectionally, in perpendicular direction with process direction

Average diameter of the Al section which you can put was made small with the 1st compact

Ti and the 2nd mixture powder molding which consists of the Al or Al alloy

The body *** to stick, temperature of 750 -1450.deg.C, by pressure above 30MPa

HIP by processing, the 1st compact and 2nd formation

As the body is connected, [chi] which is made [chitaniumuaruminaido]

Formation method of [taniumuaruminaido].

2. 1st compact [chitaniumuaruminaido]

So to be, average diameter of the Al section of the 2nd compact with 60 .micro.m or less

[chitaniumuaruminaido] of a certain claim 1 statement formation

Law.

3. -HIP process behind 750 -1450.deg.C with heat process

The truth titanium Al who is done in aerial or inert gas atmosphere

Formation method of [minaido].

4. Combination with the 1st compact and 2nd compact


The claim which grants the form of the sucking/absorbing exhaust valve for the internal combustion engine

1, [chitaniumuaruminaido] of 2 or 3 statements formation

Law.

Method for forming titanium aluminide

JP05140601

<ul style="list-style-type: none"> • Patent Assignee SUMITOMO LIGHT METAL INDUSTRIES • Inventor KUMAGAI MASAKI SHIBUE KAZUHISA • International Patent Classification B22F-001/00 B22F-003/14 B22F-003/23 C22C-001/04 C23C-010/48 	<ul style="list-style-type: none"> • Publication Information JPH05140601 A 1993-06-08 [JP05140601]  • Priority Details 1991JP-0327114 1991-11-14
<ul style="list-style-type: none"> • Family JPH05140601 A 1993-06-08 [JP05140601] 	

- **Abstract:**
(JP05140601)
PURPOSE:To easily produce a titanium aluminide formed article of intricate shape by bringing the compacts of the mixed powder of Ti and Al into contact with each other and applying HIP at specified temp. and pressure. CONSTITUTION:The compacts 2 and 3 of the mixed powder of the Ti and Al or Al alloy are brought into contact with each other. Under these conditions, HIP is applied at 750-1450 deg.C and ≥ 30 MPa. Both compacts 2 and 3 are then bonded and converted into titanium aluminide. The HIP-treated material is then heat-treated after HIP at 750-1450 deg.C in vacuum or in an inert gas atmosphere. The rod-shaped compact is engaged with the annular compact, and the product is formed into the shape of the inlet valve and exhaust valve for the internal combustion engine. Consequently, the inlet valve and exhaust valve, etc., are produced at a low cost.

Claims

(JP05140601)

Claims machine translated from Japanese

1. Ti and mixed powder forming of Al or Al alloy

To make the form contact, temperature of the 750-1450.deg.C, 30MPa from here

Connecting both compact by HIP processing by pressure above,

As it does, making [chitaniumuaruminaido] feature

With formation method of [chitaniumuaruminaido] which is done.

2. After the HIP processing heat treatment with 750-1450.deg.C

The truth the claim 1 statement which is done in aerial or inert gas atmosphere

Formation method of [chitaniumuaruminaido].

3. Mixed powder molding body in cylindrical compact annular formation





Fitting the body, to become, form of the sucking/absorbing exhaust valve for the internal combustion engine

The claim [chitaniumuaruminaido] of 1 which it grants or 2 statements

Formation method of [do].

Titanium aluminide material having excellent biadaptability

JP05269195

<ul style="list-style-type: none"> • Patent Assignee SUMITOMO LIGHT METAL INDUSTRIES • Inventor KUMAGAI MASAKI KAWABATA TAKESHI HANADA SHUJI • International Patent Classification A61C-008/00 A61F-002/28 A61F-002/30 A61L-027/00 C22C-001/04 	<ul style="list-style-type: none"> • Publication Information JPH05269195 A 1993-10-19 [JP05269195]     • Priority Details 1991JP-0072249 1991-03-11
<ul style="list-style-type: none"> • Family JPH05269195 A 1993-10-19 [JP05269195] 	

- **Abstract:**

(JP05269195)

PURPOSE:To provide the biadaptable material consisting of the porous body of titanium aluminide. CONSTITUTION:This material has a compsn. contg. 25 to 75at.% Al and consists of the balance Ti and inevitable impurities. The material has pores of 0.01 to 1mm diameter in the surface layer part down to 0.05 to 10mm under the surface of the material and the volumetric rate of the pores in the surface layer part is <=50%. The biadaptability is further improved if the volumetric rate of the pores is continuously or discontinuously lowered from the surface to the inside. The addition of Cr, Mn, B, V, Y, Mo, Nb or Si into the material for the purpose of improving the performance is possible as well.

Claims

(JP05269195)

1. To include Al25-75at%, remainder Ti

The [chitaniumuaruminaido] powder forming which consists of the inevitable impurity

Being section charge, from the surface of the said material the 0.05-1 under the surface

In the surface section to 0mm, possessing pore of diameter 0.01-1mm,

Cubic measure ratio of the pore in the aforementioned surface section is 50% or less, it is dense

With the titanium alumina which is superior in the organism compatibility which is featured

[ido] material.

2. In material, Cr0.05-10at%, M

n0.05-10at%, and B0.01-10at%

Being superior to the organism compatibility of the claim 1 statement which includes 1 kinds or more inside

It is the [chitaniumuaruminaido] material.

3. In material, each one 0.05-10at%

V, the claim which includes 1 kinds or more inside Y, Mo and Nb

Section the titanium aluminum which is superior in organism compatibility of 1 or 2 statements

[naido] material.

4. In material Si0.001-10at% containing

[mu] claim 1, [chitani] which is superior in organism compatibility of 2 or 3 statements

[umuaruminaido] material.

5. Cubic measure ratio of the pore from the surface facing toward inside

Continual or non the claim 1 which continually becomes small, 2 and 3 and

[chitaniumuaruminai] which is superior in organism compatibility of 4 section statements

[do] material.

<ul style="list-style-type: none"> • <u>Patent Assignee</u> SUMITOMO LIGHT METAL INDUSTRIES • <u>Inventor</u> KUMAGAI MASAKI KAWABATA TAKESHI • <u>International Patent Classification</u> B21J-005/00 C22C-014/00 C22C-021/00 C22F-001/00 C22F-001/04 C22F-001/18 	<ul style="list-style-type: none"> • <u>Publication Information</u> JPH03285051 A 1991-12-16 [JP03285051] • <u>Priority Details</u> 1990JP-0083573 1990-03-30
<ul style="list-style-type: none"> • <u>Fampat family</u> JPH03285051 A 1991-12-16 [JP03285051] 	

(JP03285051)





PURPOSE: To reduce the cutting amount in the subsequent stage and to produce parts made of titanium aluminide in superior material yield by forging a titanium aluminide casting with a specific composition into a shape near to the desired shape. **CONSTITUTION:** Titanium aluminide containing, by atom, 25-75% Ti and 25-75% Al as essential components or further containing one or more kinds among 0.05-10% of Cr, Mn, V, Co, Zr, Y, Mo, Nb, Hf, 0.01-10% of Ta, W, Cl, Nd, B, and 0.001-10% Si is melted and cast. The resulting casting is put into an electric furnace, heated to 800-1500 deg.C, and forged into a shape near to the desired shape. The resulting forging is heated to undergo homogenizing treatment and then finished into the final product shape by means of facing. By this method, high hardness titanium aluminide products can be produced in superior material yield by means of minimal machining. **COPYRIGHT:** (C)1991,JPO&Japio

Claims

(JP03285051)

JP8357390 1990-03-30 [1990JP-0083573]

Tial-based composite material having excellent strength and its production
JP05078762

<ul style="list-style-type: none"> <u>Patent Assignee</u> SUMITOMO LIGHT METAL INDUSTRIES <u>Inventor</u> KIN BOKUJIYUN SHIBUE KAZUHISA <u>International Patent Classification</u> B22F-003/23 C22C-001/05 C22C-014/00 C22C-029/02 C22C-029/06 C22C-029/12 C22C-029/14 C22C-032/00 	<ul style="list-style-type: none"> <u>Publication Information</u> JPH0578762 A 1993-03-30 [JP05078762] <u>Priority Details</u> 1991JP-0149816 1991-05-23 <div data-bbox="1256 421 1404 448">     </div>
<ul style="list-style-type: none"> <u>Fampat family</u> JPH0578762 A 1993-03-30 [JP05078762] 	

- **Abstract:**

(JP05078762)

PURPOSE: To provide a composite material based on a TiAl intermetallic compd. and having fine grains, no internal defect and excellent strength by a reactive sintering method. **CONSTITUTION:** A powdery Ti-Al mixture having a compsn. consisting of 35-50 atomic % Al and the balance Ti is prepd. and particles of one or more among TiB(sub 2), Al(sub 2)O(sub 3) and SiC having 0.05-20.mu.m average particle diameter are added to the mixture by <+20vol.%. They are mixed and sintered by a reactive sintering method to obtain the objective TiAl-based composite material. **COPYRIGHT:** (C)1993,JPO&Japio

Claims

(JP05078762)

Claims machine translated from Japanese

1. The combination constitution of Al35-50at% and remainder Ti

In the mixed powder of Ti and Al which it does, mean particle diameter 0.05-20 .micro.m

TiB [2] particle and Al [2] O [3] particle and SiC grain ascus

1 kinds or more of [chi] to be added with total cubic measure ratio 20% or less, the said compound

The mixed powder being synthesized by reaction sintering, becoming feature

The TiAl basic composite material which is superior in the strength which it does.

2. The claim to which the mixed powder includes Mn0.05-5at%

The TiAl basic composite material which is superior in strength of section 1 statement.

3. The combination constitution of Al35-50at% and remainder Ti

In the mixed powder of Ti and Al which it does, mean particle diameter 0.05-20 .micro.m

TiB [2] particle and Al [2] O [3] particle and SiC grain ascus

To add 1 kinds or more of [chi] with total cubic measure ratio 20% or less, the said compound mixing

In the combination powder, (the cross-sectional area before the processing/the cross-sectional area after the processing) 5 from here





After adding the kind of deformation processing which is after, the compound mixed powder material

In the temperature range below the solidus of half or more of fusion point it reacts sinters densely

That production of the TiAl basic composite material which is superior in the strength which is featured

Method.

Ti-al intermetallic compound excellent in creep strength and its production
JP10110229

<ul style="list-style-type: none"> Patent Assignee SUMITOMO LIGHT METAL INDUSTRIES Inventor FURUYAMA TSUTOMU SHIBUE KAZUHISA UNO TERUO International Patent Classification C22C-001/00 C22C-001/04 C22C-014/00 	<ul style="list-style-type: none"> Publication Information JPH10110229 A 1998-04-28 [JP10110229] <div data-bbox="1246 418 1415 448">     </div> <ul style="list-style-type: none"> Priority Details 1996JP-0281397 1996-10-02
<ul style="list-style-type: none"> Fampat family JPH10110229 A 1998-04-28 [JP10110229] 	

- **Abstract:**

(JP10110229)

PROBLEM TO BE SOLVED: To produce a Ti-Al intermetallic compound having high toughness in a specific direction and suitably usable for a turbine blade or the like by aligning the layer direction of lamellar particles to one direction without using a sophisticated technology by a unidirectional solidifying method or the like. **SOLUTION:** This Ti-Al intermetallic compound is obtd. by subjecting a powder green compact having a compsn. contg. 27 to 36 mass% Al, and the balance Ti with impurities to reaction synthesis at a high temp. under high pressure. In this case, it has a structure in which lamellar particles occupy $\geq 50\%$, and the ratio of the lamellar particles in which the angle made by the layer boundary face between γ phases and α (sub 2) phases within the lamellar particles and the elongating direction of the powder green compact is $< +40$ deg. is regulated to $\geq 60\%$. COPYRIGHT: (C)1998,JPO

Claims

(JP10110229)

1. Al: 27 -36% (mass %, the following same)

The constitution which it contains, consists of remainder Ti and the inevitable impurity

The powder molding body which it possesses high temperature and the reaction synthesis method which processes under high pressure

Being the TiAl intermetallic which is obtained by, I phase

I [2] phase laminates alternately the lamella grain which 50% or more occupying

To possess [ru] organization, I phase inside said lamella grain I [2] layer boundary of phase

The surface and expansion direction of the aforementioned powder molding body form the angle which the 40.deg.

Ratio of the lamella grain below being 60% or more feature

The TiAl intermetallic which is superior in the creeping strength which it does.

2. Constitution of powder molding body, Al: 27 -36%

To contain, furthermore Cr, V, 1 or 2 kinds among Mn

0.5 -10% to contain above with combination weighing, remainder Ti and failure

[ku] of the claim 1 statement which features that it consists of the mark impurity

The TiAl intermetallic which is superior in leap strength.

3. Constitution of powder molding body, Al: 27 -36%

To contain, furthermore 1 kind [ma] inside Mo, Zr, Ta and Hf

It is 2 kinds or more with combination weighing 0.5 -10% to contain, remainder Ti

The claim 1 which features that it consists of the calling inevitable impurity

The TiAl intermetallic which is superior in creeping strength of statement.

4. Constitution of powder molding body, Al: 27 -36%

To contain, furthermore Cr, V, 1 or 2 kinds among Mn

Above and 1 or 2 kinds inside Mo, Zr, Ta and Hf

0.5 -10% to contain above with combination weighing, remainder Ti and failure

[ku] of the claim 1 statement which features that it consists of the mark impurity

The TiAl intermetallic which is superior in leap strength.

5. The powder mixing which possesses the constitution of claim 1-4 statement

Processing union, with degree of processed 50%, or more to make the powder molding body, said

To heat the powder molding body to the temperature above the 1300.deg.C under high pressure, descending/disembarking warm

Encountering, from the 1300.deg.C descending/disembarking to eutectoid temperature of the powder molding body warm

Speed 100 .deg.C/doing the reaction synthesis which is made below amount feature

That the TiAl intermetallic which is superior in the creeping strength which is done make

Structure method.

6. The powder mixing which possesses the constitution of claim 1-4 statement

Union, extrusion processing with extrusion ratio 2, or more it makes the powder molding body,

To heat the said powder molding body to the temperature above the 1300.deg.C under high pressure, descending/disembarking

In case of warm, from the 1300.deg.C descending/disembarking to eutectoid temperature of the powder molding body

Doing the reaction synthesis which designates warm speed as below 100.deg.C/amount special

The TiAl intermetallic which is superior in the creeping strength which is made collection/symbol

Production method.

7. Extrusion processing, to make the powder molding body, the said powder forming

The form extrusion forging processing and/or after forging processing, counter

Creeping of the claim 6 statement which features that application/response synthesis is done

Production method of the TiAl intermetallic which is superior in strength.

8. Extrusion processing, to make the powder molding body, the said powder forming

After you forged processed the form, furthermore cutting processing, reaction synthesis

In creeping strength of the claim 6 statement which features that it does superior

The [re] it is production method of the TiAl intermetallic.

9. Extrusion processing, to make the powder molding body, the said powder forming

In extrusion forging processing the form, furthermore twisting and forging

The near net after forming, it reacts synthesizes in [ri] blade form

It was superior in creeping strength of the claim 6 statement which features thing

Production method of TiAl intermetallic.

JP10036928

<ul style="list-style-type: none"> <u>Patent Assignee</u> SUMITOMO LIGHT METAL INDUSTRIES <u>Inventor</u> FURUYAMA TSUTOMU SHIBUE KAZUHISA <u>International Patent Classification</u> C22C-001/04 C22C-014/00 C22F-001/18 	<ul style="list-style-type: none"> <u>Publication Information</u> JPH1036928 A 1998-02-10 [JP10036928] <u>Priority Details</u> 1996JP-0213079 1996-07-24
<ul style="list-style-type: none"> <u>Fampat family</u> JPH1036928 A 1998-02-10 [JP10036928] 	

(JP10036928)

PROBLEM TO BE SOLVED: To obtain a TiAl intermetallic compound excellent in oxidation resistance as well as in toughness and creep characteristic. **SOLUTION:** This TiAl intermetallic compound has a composition consisting of 27-36wt.% Al and the balance Ti with inevitable impurities and is produced by a reaction synthesis method where a powder green compact is treated at high temp. and high pressure. In this intermetallic compound, microstructure is composed of stratiform lamellar structure formed of α_2 phases (Ti₃Al) and γ -phases (TiAl) and the average size of lamellar grains in the lamellar structure is regulated to 500-3000 μ m. If necessary, Cl, F, Br and I, or Cr, V and Mn, or further Mo, Ta, Zr and Hf can also be added.

Claims

(JP10036928)

Claims machine translated from Japanese

1. Al: 27 -36% (mass %, the following same)

The constitution which it contains, consists of remainder Ti and the inevitable impurity

The possessing and the powder molding body high temperature and the reaction synthesis method which processes under high pressure

By, is produced to be something which, at the same time microstructure I [2] phase

(Ti [3] Al) with I phase (TiAl) from stratified it is formed

It consists of lamella organization, average of the lamella grain which is in the midst of lamella organizing

The *** characteristic which features that diameter is 500 -3000 .micro.m and

The TiAl intermetallic which is superior in creeping quality.

However, flat

As for equal lamella grain size regarding the lamella grain the crystal grain, at method of section

It is the value which it measured.

2. TiAl intermetallic, furthermore Cl:

0.01 - 0.5%, F: 0.01- 0.5%, Br: 0.01 -0.5

% I: 0.01 Above 1 or 2 kinds among - 0.5% containing

*** characteristic and the chestnut of the claim 1 statement which features that it possesses

The TiAl intermetallic which is superior in [pu] quality.

3. TiAl intermetallic, furthermore Cr,

V, above 1 or 2 kinds among Mn at total 0.7 -10

% *** characteristic of the claim 2 statement which features that it contains and

The TiAl intermetallic which is superior in creeping quality.

4. TiAl intermetallic, furthermore Mo,

Above 1 or 2 kinds inside Ta, Zr and Hf at total

0.7 The -10% the claim 2-3 statement which features that it contains

Chemical combination between the TiAl metal which are superior in *** characteristic and creeping quality Thing.

5. To possess the constitution of claim 1-4 statement, reaction combination

Depend -forming method to production do the TiAl intermetallic which, the I territory

So of 0.5 h or more it heat-treats, after that cools to below the .alpha.+gamma. territory

Doing, I phase after making the stratified organization form which consists of I phase, the plate

At the I territory it features that heat treatment 0.5 h or more

[ru] average lamella grain size from lamella organization of 500 -3000 .micro.m

Chemical combination between the TiAl metal which are superior in [ru] characteristic and creeping quality

Production method of thing.

6. To possess the constitution of claim 1-4 statement, reaction combination

Depend -forming method to production do the TiAl intermetallic which, .alpha.+gamma.

Of 0.5 h or more to heat-treat in the territory, after that to below eutectoid temperature cold

*** To do, I phase to make the stratified organization form which consists of I phase, after that

Furthermore at the I territory heat treatment 0.5 h or more feature

That is done the average lamella grain size which lamella organization of 500 -3000 .micro.m?

And others between the TiAl metal which are superior in *** characteristic and the creeping quality which become

Production method of chemical compound.

JP08277430

- **Abstract:**
(JP08277430)
PURPOSE: To provide a .gamma.-TiAl-base composite material which has excellent machinability and is excellent in cold ductility, fracture toughness and creep characteristic as well. CONSTITUTION: TiB(sub 2) particles having an average grain size of 0.1 to 20.mu.m are mixed at a ratio of 0.1 to 1.8wt.% with a mixture composed of Ti and Al and contg. 40 to 50at.% Al and after the mixture is sufficiently mixed, the mixture is subjected to a deaeration treatment and is hot can extruded at an extrusion ratio of >=5. In succession, the extruded material is cut away and is subjected to reaction sintering in an .alpha. phase. As a result, the distance between the average particles of the TiB(sub 2) particles is confined within a range of 1.5d to 10d+4.mu.m (d: the average grain size of TiB(sub 2)), the dispersion degree D defined by the equation of the TiB(sub 2) particles within a range larger than -0.4 and the crystal grain size of the lamellar structures within a range of 50 to 200.mu.m, respectively. This TiAl-base intermetallic compd. has the excellent machinability and is excellent in the cold ductility, the fracture toughness and the creep characteristic. COPYRIGHT: (C)1996.JPO

Claims

(JP08277430)

Claims machine translated from Japanese

1. The TiAl basis which Al 40-50at% is included

In parent phase, TiB [2] the .gamma.-TiAl basic compound which contains the particle

In the material,

Description above TiB [2] mean diameter d of particle example of 0.1-20 .micro.m

There is an enclosure,

Description above TiB [2] content of particle 0.1-1.8 weight % with [a]

[ri],

Description above TiB [2] distance between even particles of particle, 1.5d-10

There is the range of d+4 .micro.m,

Description above TiB [2] is defined, with the next formula of the particle the angular dispersion D which -

0.4 Rather than it is large,

[Several 1]

At the same time, crystal grain size has the lamella organization of 50-200 .micro.m

High intensity are superior in the machinability which features [ru] thing & the high ductility which

High *** characteristic .gamma.-TiAl basic composite material.

2. The above-mentioned parent phase, Mn and Cr, V, or H

1 kinds or more of f with combination weighing 1-5at% containing special

High intensity high it is superior in machinability of the claim 1 statement which is made collection/symbol

Ductile high *** characteristic .gamma.-TiAl basic composite material.

3. The above-mentioned parent phase, Mo, Ta or Zr

1 kinds or more with combination weighing 1-5at% containing feature

High intensity are superior in machinability of the claim 1 statement which it does & the high ductility which

High *** characteristic .gamma.-TiAl basic composite material.

4. The above-mentioned parent phase, Mn and Cr, V, or H

As 1-5at% it contains 1 kinds or more of f with combination weighing,

One kind or more of Mo, Ta or Zr with combination weighing 1-5a


t% machining the claim 1 statement which features that it contains

High intensity are superior in characteristic & high ductility & the high *** characteristic .gamma.-TiAl basic compound which

Material.

High strength tial intermetallic compound

JP06049569

<ul style="list-style-type: none">• Patent Assignee SUMITOMO LIGHT METAL INDUSTRIES• Inventor SHIBUE KAZUHISA KIN BOKUJIYUN KUMAGAI MASAKI MINODA TADASHI• International Patent Classification C22C-001/00 C22C-001/04 C22C-014/00 C30B-029/68	<ul style="list-style-type: none">• Publication Information JPH0649569 A 1994-02-22 [JP06049569] • Priority Details 1992JP-0203934 1992-07-30
<ul style="list-style-type: none">• Fampat family JPH0649569 A 1994-02-22 [JP06049569]	

- **Abstract:**
(JP06049569)
PURPOSE:To obtain a material having high strength and enough in ductility by incorporating a TiAl intermetallic compound with a lamellar structure in which crystalline grains are refined by specified volume ratio. CONSTITUTION:The TiAl intermetallic compound contg. 40 to 60at.% Al is incorporated with the lamellar structure constituted of gamma and alpha2 obtd. by alternately laminating Ti3Al and TiAl by >=50vol.%. The lamellar structure is a one in which crystalline grains are refined to <100mum. By this metallic structure, the high strength material whose strength shown by cold tensile strength or the like is high and enough in ductility can be obtd. Moreover, at the time of incorporating about 0.5 to 3at.% Mn into this intermetallic compound, its strength and ductility furthermore improve.

Claims

(JP06049569)

Claims machine translated from Japanese

1. Ti- where Al consists of 40-46at%

Being the Al based intermetallic, conversion between the said Ti-Al metal

In combination ones, Ti [3] Al and TiAl were laminated alternately

When lamella organization 50% or more is included in cubic measure ratio also, the said lamella

It features that crystal grain size of organization is under 100 .micro.m





[ru] high intensity Ti-Al based intermetallic.

2. The aforementioned claim which Mn 0.5-3at% is included

High intensity Ti-Al based intermetallic of 1 statements.

Oxidization-resistant tial intermettalic compound

JP04160128

<ul style="list-style-type: none"> • Patent Assignee SUMITOMO LIGHT METAL INDUSTRIES • Inventor KUMAGAI MASAKI SHIBUE KAZUHISA • International Patent Classification C22C-014/00 C22C-021/00 	<ul style="list-style-type: none"> • Publication Information JPH04160128 A 1992-06-03 [JP04160128]     • Priority Details 1990JP-0283667 1990-10-22
<ul style="list-style-type: none"> • Fampat family JPH04160128 A 1992-06-03 [JP04160128] 	

- **Abstract:**

(JP04160128)

PURPOSE:To give excellent oxidization resistance to a TiAl intermetallic compd. without losing intrinsic characteristics by incorporating specified amt. of Na of Cl into the intermetallic compd. CONSTITUTION:Na and/or Cl is incorporated by 0.01-0.5wt.% to TiAl intermetallic compd. comprising 40-50at.% Al and the balance Ti. Thereby, excellent oxidization resistance is given to the compd. without losing ductility. If necessary, 0.5-5wt.% Mn is incorporated to this intermetallic compd. The obt'd. TiAl intermetallic compd. has not only the intrinsic lightness in weight and high temp. strength property of titanium aluminide but excellent oxidization resistance. Therefore, this compd. is useful for heat-resistant members of internal combustion engine such as suction/exhaustion valves, piston pins, etc., which require the characteristics above described.

Claims

(JP04160128)

JP28366790 1990-10-22 [1990JP-0283667]