

DESCRIPTION

METHOD FOR MANUFACTURING CO-BASE SINTERED ALLOY SPUTTERING
TARGET FOR FORMATION OF MAGNETIC RECORDING FILM WHICH IS LESS
5 LIKELY TO GENERATE PARTICLES, AND CO-BASE SINTERED ALLOY
SPUTTERING TARGET FOR FORMATION OF MAGNETIC RECORDING FILM

TECHNICAL FIELD

[0001]

10 The present invention relates to a method for manufacturing a sputtering target
for the formation of a magnetic recording film that is applied to a high density magnetic
recording medium of a hard disk, in particular, a magnetic recording film that is applied
to a perpendicular magnetic recording medium; and a sputtering target for the formation
of a magnetic recording film.

15 Priority is claimed on Japanese Patent Application No. 2006-97227, filed March
31, 2006, Japanese Patent Application No. 2006-243688, filed September 8, 2006,
Japanese Patent Application No. 2007-78224, filed March 26, 2007, Japanese Patent
Application No. 2007-78223, filed March 26, 2007, and Japanese Patent Application No.
2007-78248, filed March 26, 2007, the contents of which are incorporated herein by
20 reference.

BACKGROUND ART

[0002]

Hard disk devices are generally used as an external recording device for
25 computers, digital consumer electronics, and the like and there are demands for further

improvements in their recording density. Accordingly, in recent years, a perpendicular magnetic recording method that can achieve ultrahigh density recording has been drawing attention. This perpendicular magnetic recording method is said to stabilize the record magnetization in theory as it becomes higher density unlike the conventional longitudinal recording method, and its application for practical use has been started. A CoCrPt-SiO₂ granular magnetic recording film has been proposed as a hopeful candidate for the material to be applied in the magnetic recording layer of a hard disk medium of this perpendicular magnetic recording method, and this magnetic recording film needs to be a high-performance magnetic recording film. A CoCrPt- SiO₂ granular magnetic recording film is proposed as one of the magnetic recording films that can be applied to the above, and this CoCrPt- SiO₂ granular magnetic recording film is known to be produced by a magnetron sputtering method using a Co-base sintered alloy sputtering target that includes a mixed phase of a Co-base sintered alloy phase containing Cr and Pt and a silicon dioxide phase see Non-patent Document 1).

It is known that this Co-base sintered alloy sputtering target is usually produced by first blending and mixing a silicon dioxide powder, a Cr powder, a Pt powder, and a Co powder so that a chemical composition consisting of 2 to 15 mol% of silicon dioxide, 3 to 20 mol% of Cr, 5 to 30 mol% of Pt and a remainder containing Co is obtained, and then subjecting the resulting mixed powder to a pressure sintering process employing a hot pressing method, a hot isostatic pressing method, or the like. In the production, a silicon dioxide powder produced by high temperature flame hydrolysis is used as the aforementioned silicon dioxide powder and the silicon dioxide phase dispersed in the microstructure of the target is made to have an extremely fine structure of not larger than 10 μm so as to make the generation of particles less likely (see, for example, Patent

Documents 1 and 2). Moreover, it is known that non-magnetic oxides such as TiO, Cr₂O₃, TiO₂, Ta₂O₅, Al₂O₃, BeO₂, MgO, ThO₂, ZrO₂, CeO₂, and Y₂O₃ can be used other than the aforementioned SiO₂ (see Patent Documents 3 and 4).

[Non-patent Document 1] Fuji Electric Journal Vol. 75, No. 3, 2002 (pp. 169-172)

5 [Patent Document 1] Japanese Unexamined Patent Application, First Publication No. 2001-236643

[Patent Document 2] Japanese Unexamined Patent Application, First Publication No. 2004-339586

[Patent Document 3] Japanese Unexamined Patent Application, First Publication No.
10 2003-36525

[Patent Document 4] Japanese Unexamined Patent Application, First Publication No. 2006-24346

DISCLOSURE OF INVENTION

15 PROBLEMS TO BE SOLVED BY THE INVENTION

[0003]

However, generation of particles has been unavoidable with the Co-base sintered alloy sputtering target produced by the conventional method described above, and thus a sputtering target formed of a Co-base sintered alloy which is even less likely to generate
20 particles has been required.

MEANS FOR SOLVING THE PROBLEMS

[0004]

The present inventors conducted extensive and intensive studies in order to achieve a Co-base sintered alloy sputtering target which is even less likely to generate particles and discovered the following:

- (i) one of the causes for the generation of particles is the dispersion of coarse aggregates or precipitates having Cr and O as main components (hereinafter referred to as chromium oxide aggregates) which have an absolute maximum length (maximum value of the distance between the two arbitrary points on the periphery of the particle) of more than 10 μm in the microstructure of the target; and
- (ii) in order to avoid the presence of these coarse chromium oxide aggregates in the microstructure, it is preferable to use an alloy powder having an intermetallic compound of Cr and Co, which has a chemical composition consisting of 50 to 70 atomic% of Cr and a remainder containing Co as a main component (hereinafter referred to as a Cr-Co alloy powder) as a raw material powder instead of a Cr powder.

[0005]

A first aspect of the present invention is made based on such findings and characterized by the following:

- (1) A method for manufacturing a Co-base sintered alloy sputtering target for formation of a magnetic recording film which is less likely to generate particles, the method including: providing, as raw material powders, a Cr-Co alloy powder consisting of 50 to 70 atomic% of Cr and a remainder containing Co, a Pt powder, a non-magnetic oxide powder, and a Co powder; blending and mixing the raw material powders together so as to give a chemical composition consisting of 2 to 15 mol% of a nonmagnetic oxide, 3 to 20 mol% of Cr, and 5 to 30 mol% of Pt and a remainder containing Co; and thereafter subjecting the resulting mixed powder to a pressure sintering process;

- (2) The method for manufacturing a Co-base sintered alloy sputtering target for the formation of a magnetic recording film which is less likely to generate particles according to item (1) above, wherein the non-magnetic oxide is any one of silicon dioxide, tantalum oxide, titanium oxide, aluminum oxide, magnesium oxide, thorium oxide, zirconium oxide, cerium oxide, and yttrium oxide;
- (3) The method for manufacturing a Co-base sintered alloy sputtering target for the formation of a magnetic recording film which is less likely to generate particles according to item (1) above, wherein the pressure sintering process is a hot pressing process or a hot isostatic pressing process; and
- (4) A Co-base sintered alloy sputtering target for formation of a magnetic recording film which is less likely to generate particles manufactured by any one of the methods of items (1), (2), and (3) above.

[0006]

In addition, the present inventors conducted a further study in order to achieve a Co-base sintered alloy sputtering target which is even less likely to generate particles and discovered the following:

- (iii) one of the causes for the generation of particles is the dispersion of coarse aggregates or precipitates having Cr and O as major components (hereinafter referred to as chromium oxide aggregates) which have an absolute maximum length (maximum value of the distance between two arbitrary points on the periphery of the particle) of more than 10 μm in the microstructure of the target;
- (iv) in order to avoid the presence of these coarse chromium oxide aggregates in the microstructure, it is preferable to use a binary alloy powder of Pt and Cr (hereinafter referred to as a Pt-Cr binary alloy powder), which has a chemical composition consisting

of 10 to 90 atomic% of Pt and a remainder containing Cr, as a raw material powder instead of a Cr powder; and

(v) in order to avoid the presence of these coarse chromium oxide aggregates in the microstructure, it is preferable to use the Pt-Cr binary alloy powder and a binary alloy powder of Cr and Co (hereinafter referred to as a Co-Cr binary alloy powder), which consists of 50 to 70 atomic% of Cr and a remainder containing Co, as raw material powders instead of a Cr powder.

[0007]

A second aspect of the present invention is made based on such findings and characterized by the following:

(5) A method for manufacturing a Co-base sintered alloy sputtering target for formation of a magnetic recording film which is less likely to generate particles, the method including: providing, as raw material powders, a Cr-Pt binary alloy powder consisting of 10 to 90 atomic% of Pt and a remainder containing Cr, a Pt powder, a non-magnetic oxide powder, and a Co powder; blending and mixing the raw material powders so as to give a chemical composition consisting of 2 to 15 mol% of the non-magnetic oxide, 3 to 20 mol% of Cr, and 5 to 30 mol% of Pt and a remainder containing Co; and thereafter subjecting the resulting mixed powder to a pressure sintering process;

(6) A method for manufacturing a Co-base sintered alloy sputtering target for formation of a magnetic recording film which is less likely to generate particles, the method including: providing, as raw material powders, a Cr-Pt binary alloy powder consisting of 10 to 90 atomic% of Pt and a remainder containing Cr, a Co-Cr binary alloy powder consisting of 50 to 70 atomic% of Cr and a remainder containing Co, a Pt powder, a non-magnetic oxide powder, and a Co powder; blending and mixing the raw material powders

so as to give a chemical composition consisting of 2 to 15 mol% of the non-magnetic oxide, 3 to 20 mol% of Cr, and 5 to 30 mol% of Pt and a remainder containing Co; and thereafter subjecting the resulting mixed powder to a pressure sintering process;

(7) A method for manufacturing a Co-base sintered alloy sputtering target for formation
5 of a magnetic recording film which is less likely to generate particles, the method including: providing, as raw material powders, a Cr-Pt binary alloy powder consisting of 10 to 90 atomic% of Pt and a remainder containing Cr, a Co-Cr binary alloy powder consisting of 50 to 70 atomic% of Cr and a remainder containing Co, a non-magnetic oxide powder, and a Co powder; blending and mixing the raw material powders so as to
10 give a chemical composition formed of 2 to 15 mol% of the non-magnetic oxide, 3 to 20 mol% of Cr, 5 to 30 mol% of Pt and a remainder containing Co; and thereafter subjecting the resulting mixed powder to a pressure sintering process;

(8) The method for manufacturing a Co-base sintered alloy sputtering target for the formation of a magnetic recording film which is less likely to generate particles
15 according to any one of items (5), (6), and (7) above, wherein the non-magnetic oxide is any one of silicon dioxide, tantalum oxide, titanium oxide, aluminum oxide, magnesium oxide, thorium oxide, zirconium oxide, cerium oxide, and yttrium oxide;

(9) The method for manufacturing a Co-base sintered alloy sputtering target for the formation of a magnetic recording film which is less likely to generate particles
20 according to any one of items (5), (6), and (7) above, wherein the pressure sintering process is a hot pressing process or a hot isostatic pressing process;

(10) A Co-base sintered alloy sputtering target for formation of a magnetic recording film which is less likely to generate particles manufactured by any one of the methods of items (5), (6), (7), (8), and (9) above which is a Co-base sintered alloy sputtering target

for the formation of a magnetic recording film having a chemical composition consisting of 2 to 15 mol% of the non-magnetic oxide, 3 to 20 mol% of Cr, and 5 to 30 mol% of Pt and a remainder containing Co, wherein an absolute maximum length of chromium oxide aggregates dispersed in a microstructure is not more than 10 μm ; and

- 5 (11) The Co-base sintered alloy sputtering target for the formation of a magnetic recording film which is less likely to generate particles according to item (10) above, wherein the non-magnetic oxide is any one of silicon dioxide, tantalum oxide, titanium oxide, aluminum oxide, magnesium oxide, thorium oxide, zirconium oxide, cerium oxide, and yttrium oxide.

10 [0008]

Moreover, the present inventors conducted a further more study in order to achieve a Co-base sintered alloy sputtering target which is even less likely to generate particles and discovered the following:

- (vi) since numerous particles are likely to be generated when the number of aggregates or
 15 precipitates dispersed in the microstructure of the target which have Cr and O as major components (hereinafter referred to as chromium oxide aggregates) and an absolute maximum length (maximum value of the distance between the two arbitrary points on the periphery of the particle) of more than 5 μm is more than 500 aggregates/ mm^2 , it is required that the number of chromium oxide aggregates having an absolute maximum
 20 length of more than 5 μm is not more than 500 aggregates/ mm^2 ; and
- (vii) since particles are likely to be generated when coarse chromium oxide aggregates having an absolute maximum length of more than 10 μm are dispersed in the microstructure of the target even if the number of chromium oxide aggregates having an absolute maximum length of more than 5 μm is not more than 500 aggregates/ mm^2 , it is

more preferable that the coarse chromium oxide aggregates having an absolute maximum length of more than 10 μm be absent.

[0009]

A third aspect of the present invention is made based on such findings and
5 characterized by the following:

(12) A Co-base sintered alloy sputtering target for formation of a magnetic recording film which is less likely to generate particles having a composition consisting of 2 to 15 mol% of a non-magnetic oxide, 3 to 20 mol% of Cr, and 5 to 30 mol% of Pt and a remainder containing Co and inevitable impurities, wherein the number of chromium oxide
10 aggregates having an absolute maximum length of more than 5 μm in a microstructure is not more than 500 aggregates/ mm^2 ; and

(13) The Co-base sintered alloy sputtering target for the formation of a magnetic recording film which is less likely to generate particles according to item (12) above, wherein chromium oxide aggregates having an absolute maximum length of more than
15 10 μm are absent in a target microstructure.

[0010]

The first aspect of the present invention will be described below.

The reason for limiting the composition of the Cr-Co alloy powder, which is used in the method for manufacturing a Co-base sintered alloy sputtering target for the
20 formation of a magnetic recording film which is less likely to generate particles according to the first aspect of the present invention, as described above is that when the Cr content is less than 50 atomic% or more than 70 atomic%, the amount of a Co solid solution or Cr solid solution that has a weak bond between Co and Cr increases in the powder apart from the intermetallic compound, and thus it is not preferable since Cr

readily forms coarse chromium oxide aggregates by reacting with oxygen or a non-magnetic oxide during mixing or sintering. A more preferable range of the Cr content in the Cr-Co alloy powder is 54 to 67 atomic%.

[0011]

5 The reason why chromium oxide aggregates causing the generation of particles is that chromium oxide aggregates are extremely brittle, and thus fall off or cause arcing during sputtering. Moreover, when the size of chromium oxide aggregates is large, they fall off from the target surface during processing of the target and form defects at the parts from which they fall off. The following is considered to be the reason for the
10 suppression of production of chromium oxide aggregates due to the use of the Cr-Co alloy powder as a raw material powder. An intermetallic compound phase is present between Cr and Co when the Cr content is about 54 to 67 atomic%. When Co and Cr are alloyed at about the above composition and all or most Cr is fed in the form of an intermetallic compound with Co, the Cr in the intermetallic compound is bound tightly
15 with Co and is less likely to react with oxygen or a non-magnetic oxide as compared to the case where Cr is present as a simple substance or a solid solution.

[0012]

With respect to the particle size of the Cr-Co alloy powder used in the method for manufacturing a Co-base sintered alloy sputtering target for the formation of a magnetic
20 recording film which is less likely to generate particles according to the first aspect of the present invention, it is preferable that the particle size of the Cr-Co alloy powder in terms of the 50% particle size be not more than 150 μm since satisfactory grinding cannot be carried out during the mixing/grinding process when the 50% particle size exceeds 150 μm . In addition, as the finer the particle size, the better, it is more preferable to make the

50% particle size 75 μm or less, still more preferably 45 μm or less by a classification process or the like. Moreover, both the Co powder and the Pt powder preferably have a 50% particle size of 50 μm or less (more preferably 50% particle size of 40 μm or less), and the non-magnetic oxide powder has a 50% particle size of 20 μm or less (more preferably 50% particle size of 10 μm or less). The reason for this is that it is difficult to achieve a uniform structure after mixing when the Co powder and the Pt powder have larger particle sizes. In addition, when the non-magnetic oxide powder has a particle size larger than the above-mentioned size, it is likely that large non-magnetic oxides having a size of 10 μm or more becomes present in the target even after conducting a mixing/grinding process, and they will cause arcing during sputtering or particle generation.

The aforementioned mixing of the raw material powders is preferably carried out in an inert gas atmosphere. This is because the above condition will further prevent the formation of chromium oxide aggregates due to the bonding of Cr with oxygen during mixing.

[0013]

Next, the second aspect of the present invention will be described.

The reason for limiting the composition of the Cr-Pt binary alloy powder, which is used in the method for manufacturing a Co-base sintered alloy sputtering target for the formation of a magnetic recording film which is less likely to generate particles according to the second aspect of the present invention, as described above is that when the Pt content is less than 10 atomic% or more than 90 atomic%, the amount of Cr solid solution that has a weak bond between Pt and Cr increases in the powder apart from the intermetallic compound, and thus it is not preferable since Cr readily forms chromium

oxide aggregates by reacting with oxygen or a non-magnetic oxide during mixing or sintering. A more preferable range of the Pt content in the Cr-Pt binary alloy powder is 15 to 25 atomic%. The particle size of the Cr-Pt binary alloy powder used as a raw material powder is preferably 150 μm or less since satisfactory grinding becomes
5 difficult to achieve when the particle size is larger than 150 μm , and it is more preferable to make the particle size 75 μm or less, still more preferably 45 μm or less by a classification process or the like.

[0014]

In addition, the reason for limiting the composition of the Co-Cr binary alloy
10 powder, which is used in the method for manufacturing a Co-base sintered alloy sputtering target for the formation of a magnetic recording film which is less likely to generate particles according to the second aspect of the present invention, as described above is that when the Cr content is less than 50 atomic% or more than 70 atomic%, the amount of a Co solid solution or Cr solid solution that has a weak bond between Co and
15 Cr increases in the powder apart from the intermetallic compound, and thus it is not preferable since Cr readily forms coarse chromium oxide aggregates by reacting with oxygen or a non-magnetic oxide during mixing or sintering. A more preferable range of the Cr content in the Co-Cr binary alloy powder is 54 to 67 atomic%. The particle size of the Co-Cr binary alloy powder used as a raw material powder is preferably 150 μm or
20 less since satisfactory grinding is difficult to achieve when the particle size is larger than 150 μm , and it is more preferable to make the particle size 75 μm or less, still more preferably 45 μm or less by a classification process or the like.

[0015]

As mentioned above, the reasons for chromium oxide aggregates causing the generation of particles are that chromium oxide aggregates are extremely brittle, and thus fall off or cause arcing during sputtering, and moreover, when the size of chromium oxide aggregates is large, they fall off from the target surface during processing of the target and form defects at the parts from which they fall off. It is considered that since oxidation due to the reaction with oxygen or a non-magnetic oxide is less likely to occur by using the Cr-Pt binary alloy powder or the Cr-Pt binary alloy powder and the Co-Cr binary alloy powder, in which Cr is alloyed, as raw material powders, the production of chromium oxide aggregates is suppressed, and thus the generation of particles will be less likely.

[0016]

Moreover, both the Co powder and the Pt powder, which are used in the method for manufacturing a Co-base sintered alloy sputtering target for the formation of a magnetic recording film which is less likely to generate particles according to the second aspect of the present invention, preferably have a 50% particle size of 50 μm or less (more preferably 50% particle size of 40 μm or less), and the non-magnetic oxide powder has a 50% particle size of 20 μm or less (more preferably 50% particle size of 10 μm or less). The reason for this is that it is difficult to achieve a uniform structure after mixing when the Co powder and the Pt powder have larger particle sizes. In addition, when the non-magnetic oxide powder has a particle size larger than the above-mentioned size, it is likely that large non-magnetic oxides having a size of 10 μm or more becomes present in the target even after conducting a mixing/grinding process, and they will cause arcing during sputtering or particle generation. The aforementioned mixing of the raw material powders is preferably carried out in an inert gas atmosphere. This is because the above

condition will further prevent the formation of chromium oxide aggregates due to the bonding of Cr with oxygen during mixing.

[0017]

Next, the third aspect of the present invention will be described.

5 The reason for limiting the number of chromium oxide aggregates having an absolute maximum length (maximum value of the distance between two arbitrary points on the periphery of the particle) of more than 5 μm , in the microstructure of the Co-base sintered alloy sputtering target for the formation of a magnetic recording film which is less likely to generate particles according to the third aspect of the present invention,
10 being not more than 500 aggregates/ mm^2 is that the chromium oxide aggregates having an absolute maximum length of not more than 5 μm have little effects when falling off or causing arcing during sputtering, and even when the chromium oxide aggregates having an absolute maximum length of more than 5 μm are present, the generation of particles remains at a low level and does not lead to failures in the film formation if the number of
15 aggregates is not more than 500 aggregates/ mm^2 .

[0018]

By using the Cr-Co alloy powder consisting of 50 to 70 atomic% of Cr and a remainder containing Co when manufacturing the Co-base sintered alloy sputtering target for the formation of a magnetic recording film which is less likely to generate particles
20 according to the third aspect of the present invention, it becomes possible to manufacture a Co-base sintered alloy sputtering target for the formation of a magnetic recording film in which the number of chromium oxide aggregates having an absolute maximum length of more than 5 μm being not more than 500 aggregates/ mm^2 . The reason for limiting the composition of the Cr-Co alloy powder as described above is that when the Cr content is

less than 50 atomic% or more than 70 atomic%, the amount of a Co solid solution or Cr solid solution that has a weak bond between Co and Cr increases in the powder apart from the intermetallic compound, and thus it is not preferable since Cr readily forms coarse chromium oxide aggregates by reacting with oxygen or a non-magnetic oxide during mixing or sintering. A more preferable range of the Cr content in the Cr-Co alloy powder is 54 to 67 atomic%. In addition, similar effects can also be attained by using a Cr-Pt alloy powder or a Cr-Co-Pt alloy powder.

As mentioned above, the reasons for chromium oxide aggregates causing the generation of particles are that chromium oxide aggregates are extremely brittle, and thus fall off or cause arcing during sputtering, and moreover, when the size of chromium oxide aggregates is large, they fall off from the target surface during processing of the target and form defects at parts from which they fall off. The following is considered to be the reason for the suppression of production of chromium oxide aggregates due to the use of the Cr-Co alloy powder as a raw material powder. An intermetallic compound phase is present between Cr and Co when the Cr content is about 54 to 67 atomic%. When Co and Cr are alloyed at about the above composition and all or most Cr is fed in the form of an intermetallic compound with Co, the Cr in the intermetallic compound is tightly bound with Co and is less likely to react with oxygen or a non-magnetic oxide as compared to the case where Cr is present as a simple substance or a solid solution.

[0019]

With respect to the particle size of the Cr-Co alloy powder used for manufacturing a Co-base sintered alloy sputtering target for the formation of a magnetic recording film which is less likely to generate particles according to the third aspect of the present invention, it is preferable that the particle size of the Cr-Co alloy powder in

terms of the 50% particle size be not more than 150 μm since satisfactory grinding cannot be carried out during the mixing/grinding process when the 50% particle size exceeds 150 μm . In addition, as the finer the particle size is, the better, it is more preferable to make the 50% particle size 75 μm or less, still more preferably 45 μm or less by a classification process or the like. Moreover, both the Co powder and the Pt powder preferably have a 50% particle size of 50 μm or less (more preferably 50% particle size of 40 μm or less), and the non-magnetic oxide powder has a 50% particle size of 20 μm or less (more preferably 50% particle size of 10 μm or less). The reason for this is that it is difficult to achieve a uniform structure after mixing when the Co powder and the Pt powder have larger particle sizes. In addition, when the non-magnetic oxide powder has a particle size larger than the above-mentioned size, it is likely that large non-magnetic oxides having a size of 10 μm or more becomes present in the target even after conducting a mixing/grinding process, and they will cause arcing during sputtering or particle generation.

The aforementioned mixing of the raw material powders is preferably carried out in an inert gas atmosphere. This is because the above condition is able to further prevent the formation of chromium oxide aggregates due to the bonding of Cr with oxygen during mixing.

EFFECTS OF THE INVENTION

[0020]

The present invention can provide a sputtering target capable of forming an excellent magnetic recording film that is even less likely to generate particles, and thus

can greatly contribute to the progress in the industries of computers, digital consumer electronics, and the like.

BEST MODE FOR CARRYING OUT THE INVENTION

5 [0021]

<First aspect>

Co-Cr alloy powders A to J having chemical compositions shown in Table 1 were prepared as raw material powders by a gas atomizing method. Since the Co-Cr alloy powders A to J obtained by the gas atomizing method had a 50% particle size of 95 μm ,
10 the Co-Cr alloy powders A to J were classified using a sieve with an aperture size of 45 μm so that the 50% particle size of all the powders measured by a laser diffraction method would be 35 μm . Moreover, a Co powder having a 50% particle size of 10 μm , a Pt powder having a 50% particle size of 15 μm , an SiO_2 powder having a 50% particle size of 3 μm , a TiO_2 powder having a 50% particle size of 3 μm , a Ta_2O_5 powder having
15 a 50% particle size of 3 μm , and a Cr powder having a 50% particle size of 10 μm which were commercially available were prepared.

[0022]

[Table 1]

Type		50% particle size (μm)	Composition (atomic%)	
			Cr	Co
Co-Cr alloy powder	A	35	50	Remainder
	B		54	Remainder
	C		58	Remainder
	D		60	Remainder
	E		62	Remainder
	F		65	Remainder
	G		67	Remainder
	H		70	Remainder
	I		48*	Remainder
	J		72*	Remainder

Symbols (*) indicate conditions outside the scope of the present invention.

[0023]

Example 1

The raw material powders prepared above were blended so as to give the compositions shown in Table 2 and the obtained blended powders were charged in a 10 L container together with a zirconia ball, which was a grinding medium. The atmosphere inside this container was replaced with an Ar gas atmosphere and thereafter, the container was sealed. This container was rotated for 16 hours using a ball mill to prepare mixed powders.

Methods 1A to 8A of the present invention, comparative methods 1A and 2A, and a conventional method 1A were conducted as follows. The obtained mixed powders were filled in a vacuum hot press apparatus and were subjected to a vacuum hot pressing process in a vacuum atmosphere under conditions in which the powders were retained at a temperature of 1,200°C and a pressure of 15 MPa for 3 hours to produce hot pressed bodies having the compositions shown in Table 2. These hot pressed bodies were cut to produce targets having a diameter of 152.4 mm and a thickness of 3 mm.

[0024]

Absolute maximum lengths (maximum value of the distance between the two arbitrary points on the periphery of the particle) of the chromium oxide aggregates dispersed in the microstructure of the targets produced by the aforementioned methods 1A to 8A of the present invention, the comparative methods 1A and 2A, and the conventional method 1A were measured by an electron probe microanalyzer (EPMA). The presence/absence of coarse chromium oxide aggregates having an absolute maximum length of more than 10 μm is shown in Table 2.

Measurements of the absolute maximum length of chromium oxide aggregates using an EPMA were conducted as follows. Samples were cut out from the hot pressed bodies produced by the aforementioned methods 1A to 8A of the present invention, the comparative methods 1A and 2A, and the conventional method 1A and the sections thereof were embedded in a resin to be subjected to a mirror polishing process. Surface analysis was conducted on the structures of these sections using a field emission EPMA (JXA-8500F manufactured by JEOL Ltd.) at an acceleration voltage of 15 kV, an irradiation current of 5×10^{-8} A, and a magnification of 1,000 to acquire an element mapping image of Cr. This element mapping image of Cr was made to be an image with a contrast and a color tone so that the regions enriched with Cr (that is, chromium oxide aggregates) can be clearly discriminated as much as possible. The obtained element mapping image of Cr was saved as an image file of bitmap format without degrading the image quality and this image was read separately using image processing software (Win Roof manufactured by Mitani Corporation) to binarize the image. Absolute maximum length of the regions enriched with Cr as compared to the matrix was measured by image processing. A threshold value was selected for binarization so that the size of the Cr enriched regions did not change from that of the original image. A scale bar indicated on

the original element mapping image of Cr by EPMA was used for the calibration of length during measurements.

[0025]

Moreover, the targets obtained by the aforementioned methods 1A to 8A of the present invention, the comparative methods 1A and 2A, and the conventional method 1A were degreased using an organic solvent and were subsequently subjected to vacuum drying by being retained under vacuum at 150°C for 8 hours. Thereafter, the targets were joined with a backing plate made of copper and were mounted on a commercially available sputtering apparatus. A presputtering process was carried out under conditions in which the ultimate vacuum was 5×10^{-5} Pa, the electrical power was 800 W in direct current, the Ar gas pressure was 6.0 Pa, the distance between the target and the substrate was 60 mm, and no substrate heating, to remove the processed layer of the target surface. Then the chamber was temporarily opened to air and the chamber members such as a deposition preventing plate were cleaned. Thereafter, vacuuming was carried out until the above-mentioned vacuum was achieved again. After the vacuuming, a presputtering process was carried out for 30 minutes to remove adsorbed atmospheric components and metal oxide layers, followed by the formation of a magnetic recording film having a thickness of 100 nm on a 4-inch Si wafer. Magnetic recording films having a thickness of 100 nm were formed on a total of 25 pieces of 4-inch Si wafer under the same conditions. With respect to the wafer after the film formation, the number of particles attached on the wafer surface and having a size of 1.0 μm or more was counted using a surface inspection apparatus that was commercially available and the average value of the counts obtained from 25 wafers was calculated. The results are shown in Table 2.

[0026]

[Table 2]

Type	Composition of raw material powder (% by mass)					Composition of target (mol%)				Presence/absence of Cr oxides having absolute maximum length larger than 10 μm	Number of particles
	Alloy powder of Table 1	Pt powder	SiO ₂ powder	Cr powder	Co powder	Cr	Pt	SiO ₂	Co		
Method of present invention	1A	A: 14.9	39.3	7.5	-	10.8	16.2	10.0	Remainder	Absent	75
	2A	B: 13.7							Remainder	Absent	52
	3A	C: 12.7							Remainder	Absent	63
	4A	D: 12.3							Remainder	Absent	54
	5A	E: 11.8							Remainder	Absent	60
	6A	F: 11.3							Remainder	Absent	62
	7A	G: 10.9							Remainder	Absent	81
	8A	H: 10.4							Remainder	Absent	95
Comparative method	1A	I: 15.6	-	7.0	-	-	-	-	Remainder	Present	155
	2A	J: 10.1							Remainder	Present	182
Conventional method 1A	-	-	-	-	-	-	-	-	Remainder	Present	205

Symbols (*) indicate conditions outside the scope of the present invention.

[0027]

From the results shown in Table 2, it is apparent that the targets produced by the aforementioned methods 1A to 8A of the present invention which were produced by blending the Co-Cr alloy powders A to H having a Cr content of 50 to 70 atomic% and a remainder containing Co as the raw material powders generated less particles as compared to the target produced by the conventional method 1A which was produced by blending and mixing a Co powder having a 50% particle size of 10 μm , a Cr powder having a 50% particle size of 10 μm , a Pt powder having a 50% particle size of 15 μm , and an SiO_2 powder having a 50% particle size of 3 μm without adding a Co-Cr alloy powder. However, it is apparent that the targets produced by the comparative methods 1A and 2A which were produced using the Co-Cr alloy powders I to J having compositions that were outside the scope of the present invention generated numerous particles, and thus were not preferable.

[0028]

Example 2

The raw material powders prepared above were blended so as to give the compositions shown in Table 3 and the obtained blended powders were charged in a 10 L container together with a zirconia ball, which was a grinding medium. The atmosphere inside this container was replaced with an Ar gas atmosphere and thereafter, the container was sealed. This container was rotated for 16 hours using a ball mill to prepare mixed powders.

The obtained mixed powders were filled in an SUS container and were subjected to a vacuum degassing treatment under conditions in which the powders were retained at a temperature of 550°C for 12 hours, and thereafter the mixed powders were vacuum

encapsulated by sealing the SUS container. Methods 9A to 16A of the present invention, comparative methods 3A and 4A, and a conventional method 2A were conducted as follows. The SUS container filled with the mixed powders was subjected to a hot isostatic pressing process under conditions in which the powders were retained at a temperature of 1,200°C and a pressure of 100 MPa for 3 hours followed by opening the SUS container to produce hot isostatic pressed bodies having the compositions shown in Table 3. These hot isostatic pressed bodies were cut to produce targets having a diameter of 152.4 mm and a thickness of 3 mm.

[0029]

Absolute maximum lengths (maximum value of the distance between the two arbitrary points on the periphery of the particle) of the chromium oxide aggregates dispersed in the microstructure of the target produced by the aforementioned methods 9A to 16A of the present invention, the comparative methods 3A and 4A, and the conventional method 2A were measured by an EPMA. The presence/absence of coarse chromium oxide aggregates having an absolute maximum length of more than 10 μm is shown in Table 3.

Measurements of the absolute maximum length of chromium oxide aggregates using an EPMA were conducted as follows. Samples were cut out from the targets produced by the aforementioned methods 9A to 16A of the present invention, the comparative methods 3A and 4A, and the conventional method 2A and the sections thereof were embedded in a resin to be subjected to a mirror polishing process. Surface analysis was conducted on the structures of these sections using a field emission EPMA (JXA-8500F manufactured by JEOL Ltd.) at an acceleration voltage of 15 kV, an irradiation current of 5×10^{-8} A, and a magnification of 1,000 $\times$ to acquire an element

mapping image of Cr. This element mapping image of Cr was made to be an image with a contrast and a color tone so that the regions enriched with Cr (that is, chromium oxide aggregates) can be clearly discriminated as much as possible.

The obtained element mapping image of Cr was saved as an image file of bitmap
5 format without degrading the image quality and this image was read separately using image processing software (Win Roof manufactured by Mitani Corporation) to binarize the image. Absolute maximum lengths of the regions enriched with Cr as compared to the matrix were measured by image processing. A threshold value was selected for binarization so that the size of the Cr enriched regions did not change from that of the
10 original image. A scale bar indicated on the original element mapping image of Cr by EPMA was used for the calibration of length during measurements.

[0030]

Moreover, the targets obtained by the aforementioned methods 9A to 16A of the present invention, the comparative methods 3A and 4A, and the conventional method 2A
15 were degreased using an organic solvent and were subsequently subjected to vacuum drying by being retained under vacuum at 150°C for 8 hours. Thereafter, the targets were joined with a backing plate made of copper and were mounted on a commercially available sputtering apparatus. A presputtering process was carried out under conditions in which the ultimate vacuum was 5×10^{-5} Pa, the electrical power was 800 W in direct
20 current, the Ar gas pressure was 6.0 Pa, the distance between the target and the substrate was 60 mm, and no substrate heating, to remove the processed layer of the target surface. Then the chamber was temporarily opened to air and the chamber members such as a deposition preventing plate were cleaned. Thereafter, vacuuming was carried out until the above-mentioned vacuum was achieved again. After the vacuuming, a presputtering

process was carried out for 30 minutes to remove adsorbed atmospheric components and metal oxide layers, followed by the formation of a magnetic recording film having a thickness of 100 nm on a 4-inch Si wafer. Magnetic recording films having a thickness of 100 nm were formed on a total of 25 pieces of 4-inch Si wafer under the same conditions. With respect to the wafer after the film formation, the number of particles attached on the wafer surface and having a size of 1.0 μm or more was counted using a surface inspection apparatus that was commercially available and the average value of the counts obtained from 25 wafers was calculated. The results are shown in Table 3.

[0031]

10

[Table 3]

Type	Composition of raw material powder (% by mass)						Composition of target (mol%)				Presence/absence of Cr oxides having absolute maximum length larger than 10 μm	Number of particles
	Alloy powder of Table 1	Pt powder	SiO ₂ powder	Cr powder	Co powder		Cr	Pt	SiO ₂	Co		
Method of present invention	9A	A: 24.3	42.8	3.7	-		18.1	18.1	5.0	Remainder	Absent	66
	10A	B: 22.4								Remainder	Absent	45
	11A	C: 20.8								Remainder	Absent	57
	12A	D: 20.0								Remainder	Absent	48
	13A	E: 19.3								Remainder	Absent	58
	14A	F: 18.4								Remainder	Absent	55
	15A	G: 17.8								Remainder	Absent	75
	16A	H: 16.9								Remainder	Absent	92
Comparative method	3A	I: 25.4								Remainder	Present	150
Conventional method 2A	4A	J: 16.4								Remainder	Present	173
		-		11.4	Remainder					Remainder	Present	195

[0032]

From the results shown in Table 3, it is apparent that the targets produced by the aforementioned methods 9A to 16A of the present invention which were produced by blending the Co-Cr alloy powders A to H having a Cr content of 50 to 70 atomic% and a remainder containing Co as the raw material powders generated less particles as compared to the target produced by the conventional method 2A which was produced by blending and mixing a Co powder having a 50% particle size of 10 μm , a Cr powder having a 50% particle size of 10 μm , a Pt powder having a 50% particle size of 15 μm , and an SiO_2 powder having a 50% particle size of 3 μm without adding a Co-Cr alloy powder. However, it is apparent that the targets produced by the comparative methods 3A and 4A which were produced using the Co-Cr alloy powders I to J having compositions that were outside the scope of the present invention generated numerous particles, and thus were not preferable.

[0033]

15 Example 3

The raw material powders prepared above were blended so as to give the compositions shown in Table 4 and the obtained blended powders were charged in a 10 L container together with a zirconia ball, which will be a grinding medium. The atmosphere inside this container was replaced with an Ar gas atmosphere and thereafter, the container was sealed. This container was rotated for 16 hours using a ball mill to prepare mixed powders.

Methods 17A to 24A of the present invention, comparative methods 5A and 6A, and a conventional method 3A were conducted as follows. The obtained mixed powders were filled in a vacuum hot press apparatus and were subjected to a vacuum hot pressing

process in a vacuum atmosphere under conditions in which the powders were retained at a temperature of 1,200°C and a pressure of 15 MPa for 3 hours to produce hot pressed bodies having the compositions shown in Table 4. These hot pressed bodies were cut to produce targets having a diameter of 152.4 mm and a thickness of 3 mm.

5 [0034]

Absolute maximum lengths (maximum value of the distance between the two arbitrary points on the periphery of the particle) of the chromium oxide aggregates dispersed in the microstructure of the targets produced by the aforementioned methods 17A to 24A of the present invention, the comparative methods 5A and 6A, and the
10 conventional method 3A were measured by an EPMA. The presence/absence of coarse chromium oxide aggregates having an absolute maximum length of more than 10 μm is shown in Table 4.

Measurements of the absolute maximum length of chromium oxide aggregates using an EPMA were conducted as follows. Samples were cut out from the targets
15 produced by the aforementioned methods 17A to 24A of the present invention, the comparative methods 5A and 6A, and the conventional method 3A and the sections thereof were embedded in a resin to be subjected to a mirror polishing process. Surface analysis was conducted on the structures of these sections using a field emission EPMA (JXA-8500F manufactured by JEOL Ltd.) at an acceleration voltage of 15 kV, an
20 irradiation current of 5×10^{-8} A, and a magnification of 1,000 to acquire an element mapping image of Cr. This element mapping image of Cr was made to be an image with a contrast and a color tone so that the regions enriched with Cr (that is, chromium oxide aggregates) can be clearly discriminated as much as possible. The obtained element mapping image of Cr was saved as an image file of bitmap format without degrading the

image quality and this image was read separately using image processing software (Win Roof manufactured by Mitani Corporation) to binarize the image. Absolute maximum lengths of the regions enriched with Cr as compared to the matrix were measured by image processing. A threshold value was selected for binarization so that the size of the Cr enriched regions did not change from that of the original image. A scale bar indicated on the original element mapping image of Cr by EPMA was used for the calibration of length during measurements.

[0035]

Moreover, the targets obtained by the aforementioned methods 17A to 24A of the present invention, the comparative methods 5A and 6A, and the conventional method 3A were degreased using an organic solvent and were subsequently subjected to vacuum drying by being retained under vacuum at 150°C for 8 hours. Thereafter, the targets were joined with a backing plate made of copper and were mounted on a commercially available sputtering apparatus. A presputtering process was carried out under conditions in which the ultimate vacuum was 5×10^{-5} Pa, the electrical power was 800 W in direct current, the Ar gas pressure was 6.0 Pa, the distance between the target and the substrate was 60 mm, and no substrate heating, to remove the processed layer of the target surface. Then the chamber was temporarily opened to air and the chamber members such as a deposition preventing plate were cleaned. Thereafter, vacuuming was carried out until the above-mentioned vacuum was achieved again. After the vacuuming, a presputtering process was carried out for 30 minutes to remove adsorbed atmospheric components and metal oxide layers, followed by the formation of a magnetic recording film having a thickness of 100 nm on a 4-inch Si wafer. Magnetic recording films having a thickness of 100 nm were formed on a total of 25 pieces of 4-inch Si wafer under the same

conditions. With respect to the wafer after the film formation, the number of particles attached on the wafer surface and having a size of 1.0 μm or more was counted using a surface inspection apparatus that was commercially available and the average value of the counts obtained from 25 wafers was calculated. The results are shown in Table 4.

5 [0036]
 [Table 4]

Type	Composition of raw material powder (% by mass)					Composition of target (mol%)				Presence/absence of Cr oxides having absolute maximum length larger than 10 μm	Number of particles
	Alloy powder of Table 1	Pt powder	TiO ₂ powder	Cr powder	Co powder	Cr	Pt	TiO ₂	Co		
Method of present invention	17A	A: 14.6	38.4	6.8	-	10.8	16.2	10.0	Remainder	Absent	63
	18A	B: 13.4							Remainder	Absent	48
	19A	C: 12.4							Remainder	Absent	46
	20A	D: 12.0							Remainder	Absent	52
	21A	E: 11.6							Remainder	Absent	57
	22A	F: 11.0							Remainder	Absent	68
	23A	G: 10.6							Remainder	Absent	74
	24A	H: 10.1							Remainder	Absent	89
Comparative method	5A	I: 15.2	-	6.8	-	-	-	-	Remainder	Present	160
Conventional method 3A	6A	J: 9.8							Remainder	Present	168
	-	-							Remainder	Present	195

Symbols (*) indicate conditions outside the scope of the present invention.

[0037]

From the results shown in Table 4, it is apparent that the targets produced by the aforementioned methods 17A to 24A of the present invention which were produced by blending the Co-Cr alloy powders A to H having a Cr content of 50 to 70 atomic% and a remainder containing Co as the raw material powders generated less particles as compared to the target produced by the conventional method 3A which was produced by blending and mixing a Co powder having a 50% particle size of 10 μm , a Cr powder having a 50% particle size of 10 μm , a Pt powder having a 50% particle size of 15 μm , and an TiO_2 powder having a 50% particle size of 3 μm without adding a Co-Cr alloy powder. However, it is apparent that the targets produced by the comparative methods 5A and 6A which were produced using the Co-Cr alloy powders I to J having compositions that were outside the scope of the present invention generated numerous particles, and thus were not preferable.

[0038]

15 Example 4

The raw material powders prepared above were blended so as to give the compositions shown in Table 5 and the obtained blended powders were charged in a 10 L container together with a zirconia ball, which was a grinding medium. The atmosphere inside this container was replaced with an Ar gas atmosphere and thereafter, the container was sealed. This container was rotated for 16 hours using a ball mill to prepare mixed powders.

The obtained mixed powders were filled in an SUS container and were subjected to a vacuum degassing treatment under conditions in which the powders were retained at a temperature of 550°C for 12 hours, and thereafter the mixed powders were vacuum

encapsulated by sealing the SUS container. Methods 25A to 32A of the present invention, comparative methods 7A and 8A, and a conventional method 4A were conducted as follows. The SUS container filled with the mixed powders was subjected to a hot isostatic pressing process under conditions in which the powders were retained at a temperature of 1,200°C and a pressure of 100 MPa for 3 hours followed by opening the SUS container to produce hot isostatic pressed bodies having the compositions shown in Table 5. These hot isostatic pressed bodies were cut to produce targets having a diameter of 152.4 mm and a thickness of 3 mm.

[0039]

Absolute maximum lengths (maximum value of the distance between the two arbitrary points on the periphery of the particle) of the chromium oxide aggregates dispersed in the microstructure of the targets produced by the aforementioned methods 25A to 32A of the present invention, the comparative methods 7A and 8A, and the conventional method 4A were measured by an EPMA. The presence/absence of coarse chromium oxide aggregates having an absolute maximum length of more than 10 μm is shown in Table 5.

Measurements of the absolute maximum length of chromium oxide aggregates using an EPMA were conducted as follows. Samples were cut out from the targets produced by the aforementioned methods 25A to 32A of the present invention, the comparative methods 7A and 8A, and the conventional method 4A and the sections thereof were embedded in a resin to be subjected to a mirror polishing process. Surface analysis was conducted on the structures of these sections using a field emission EPMA (JXA-8500F manufactured by JEOL Ltd.) at an acceleration voltage of 15 kV, an irradiation current of 5×10^{-8} A, and a magnification of 1,000 to acquire an element

mapping image of Cr. This element mapping image of Cr was made to be an image with a contrast and a color tone so that the regions enriched with Cr (that is, chromium oxide aggregates) can be clearly discriminated as much as possible. The obtained element mapping image of Cr was saved as an image file of bitmap format without degrading the image quality and this image was read separately using image processing software (Win Roof manufactured by Mitani Corporation) to binarize the image. Absolute maximum lengths of the regions enriched with Cr as compared to the matrix were measured by image processing. A threshold value was selected for binarization so that the size of the Cr enriched regions did not change from that of the original image. A scale bar indicated on the original element mapping image of Cr by EPMA was used for the calibration of length during measurements.

[0040]

Moreover, the targets obtained by the aforementioned methods 25A to 32A of the present invention, the comparative methods 7A and 8A, and the conventional method 4A were degreased using an organic solvent and were subsequently subjected to vacuum drying by being retained under vacuum at 150°C for 8 hours. Thereafter, the targets were joined with a backing plate made of copper and were mounted on a commercially available sputtering apparatus. A presputtering process was carried out under conditions in which the ultimate vacuum was 5×10^{-5} Pa, the electrical power was 800 W in direct current, the Ar gas pressure was 6.0 Pa, the distance between the target and the substrate was 60 mm, and no substrate heating, to remove the processed layer of the target surface. Then the chamber was temporarily opened to air and the chamber members such as a deposition preventing plate were cleaned. Thereafter, vacuuming was carried out until the above-mentioned vacuum was achieved again. After the vacuuming, a presputtering

process was carried out for 30 minutes to remove adsorbed atmospheric components and metal oxide layers, followed by the formation of a magnetic recording film having a thickness of 100 nm on a 4-inch Si wafer. Magnetic recording films having a thickness of 100 nm were formed on a total of 25 pieces of 4-inch Si wafer under the same conditions. With respect to the wafer after the film formation, the number of particles attached on the wafer surface and having a size of 1.0 μm or more was counted using a surface inspection apparatus that was commercially available and the average value of the counts obtained from 25 wafers was calculated. The results are shown in Table 5.

[0041]

10

[Table 5]

Type	Composition of raw material powder (% by mass)						Composition of target (mol%)				Presence/absence of Cr oxides having absolute maximum length larger than 10 μm	Number of particles
	Alloy powder of Table.1	Pt powder	Ta ₂ O ₅ powder	Cr powder	Co powder		Cr	Pt	Ta ₂ O ₅	Co		
Method of present invention	25A	A: 19.8	34.8	21.8	-	Remainder	18.1	18.1	5.0	Remainder	Absent	65
	26A	B: 18.2				Remainder				Remainder	Absent	52
	27A	C: 16.9				Remainder				Remainder	Absent	54
	28A	D: 16.3				Remainder				Remainder	Absent	55
	29A	E: 15.7				Remainder				Remainder	Absent	62
	30A	F: 14.9				Remainder				Remainder	Absent	68
	31A	G: 14.5				Remainder				Remainder	Absent	75
	32A	H: 13.8				Remainder				Remainder	Absent	86
Comparative method	7A	I: 20.7				Remainder				Remainder	Present	125
	8A	J: 13.4				Remainder				Remainder	Present	147
Conventional method 4A	-	-			9.3	Remainder				Remainder	Present	155

[0042]

From the results shown in Table 5, it is apparent that the targets produced by the
aforementioned methods 25A to 32A of the present invention which were produced by
blending the Co-Cr alloy powders A to H having a Cr content of 50 to 70 atomic% and a
5 remainder containing Co as the raw material powders generated less particles as
compared to the target produced by the conventional method 4A which was produced by
blending and mixing a Co powder having a 50% particle size of 10 μm , a Cr powder
having a 50% particle size of 10 μm , a Pt powder having a 50% particle size of 15 μm ,
and an Ta_2O_5 powder having a 50% particle size of 3 μm without adding a Co-Cr alloy
10 powder. However, it is apparent that the targets produced by the comparative methods
7A and 8A which were produced using the Co-Cr alloy powders I to J having
compositions that were outside the scope of the present invention generated numerous
particles, and thus were not preferable.

[0043]

15 <Second aspect>

Cr-Pt binary alloy powders A to S having chemical compositions shown in Table
6 were prepared as raw material powders by a gas atomizing method. Since the Cr-Pt
binary alloy powders A to S obtained by the gas atomizing method had a 50% particle
size of 95 μm , the Cr-Pt binary alloy powders A to S were classified using a sieve with
20 an aperture size of 45 μm so that the 50% particle size of all the powders measured by a
laser diffraction method would be 35 μm .

In addition, Co-Cr binary alloy powders a to j having chemical compositions
shown in Table 7 were prepared as raw material powders by a gas atomizing method.
Since the Co-Cr binary alloy powders a to j obtained by the gas atomizing method had a

50% particle size of 95 μm , the Co-Cr binary alloy powders a to j were classified using a sieve with an aperture size of 45 μm so that the 50% particle size of all the powders measured by a laser diffraction method would be 35 μm . Moreover, a Co powder having a 50% particle size of 10 μm , a Pt powder having a 50% particle size of 15 μm , an SiO_2 powder having a 50% particle size of 3 μm , a TiO_2 powder having a 50% particle size of 3 μm , a Ta_2O_5 powder having a 50% particle size of 3 μm , and a Cr powder having a 50% particle size of 10 μm which were commercially available were prepared.

[0044]

[Table 6]

Type		50% particle size (μm)	Composition (atomic%)	
			Pt	Cr
Cr-Pt binary alloy powder	A	35	10	Remainder
	B		15	Remainder
	C		20	Remainder
	D		25	Remainder
	E		30	Remainder
	F		35	Remainder
	G		40	Remainder
	H		45	Remainder
	I		50	Remainder
	J		55	Remainder
	K		60	Remainder
	L		65	Remainder
	M		70	Remainder
	N		75	Remainder
	O		80	Remainder
	P		85	Remainder
	Q		90	Remainder
	R		5*	Remainder
	S		95*	Remainder

Symbols (*) indicate conditions outside the scope of the present invention.

[0045]

[Table 7]

Type		50% particle size (μm)	Composition (atomic%)	
			Cr	Co
Co-Cr binary alloy powder	a	35	50	Remainder
	b		54	Remainder
	c		58	Remainder
	d		60	Remainder
	e		62	Remainder
	f		65	Remainder
	g		67	Remainder
	h		70	Remainder
	i		48*	Remainder
	j		72*	Remainder

Symbols (*) indicate conditions outside the scope of the present invention.

[0046]

Example 5

The raw material powders prepared above were blended so as to give the compositions shown in Table 8 and the obtained blended powders were charged in a 10 L container together with a zirconia ball, which was a grinding medium. The atmosphere inside this container was replaced with an Ar gas atmosphere and thereafter, the container was sealed. This container was rotated for 16 hours using a ball mill to prepare mixed powders.

Methods 1B to 11B of the present invention, a comparative method 1B, and a conventional method 1B were conducted as follows. The obtained mixed powders were filled in a vacuum hot press apparatus and were subjected to a vacuum hot pressing process in a vacuum atmosphere under conditions in which the powders were retained at a temperature of 1,200°C and a pressure of 15 MPa for 3 hours to produce hot pressed bodies. These hot pressed bodies were cut to produce targets having a diameter of 152.4 mm and a thickness of 3 mm as well as a chemical composition consisting of 10.1 mol% of Cr, 15.6 mol% of Pt, 8.0 mol% of SiO₂ and a remainder containing Co.

[0047]

Absolute maximum lengths (maximum value of the distance between the two arbitrary points on the periphery of the particle) of the chromium oxide aggregates dispersed in the microstructure of the targets produced by the aforementioned methods 1B to 11B of the present invention, the comparative method 1B, and the conventional method 1B were measured by an EPMA. The presence/absence of coarse chromium oxide aggregates having an absolute maximum length of more than 10 μm is shown in Table 8.

Measurements of the absolute maximum length of chromium oxide aggregates using an EPMA were conducted as follows. Samples were cut out from the hot pressed bodies produced by the aforementioned methods 1B to 11B of the present invention, the comparative method 1B, and the conventional method 1B and the sections thereof were embedded in a resin to be subjected to a mirror polishing process. Surface analysis was conducted on the structures of these sections using a field emission EPMA (JXA-8500F manufactured by JEOL Ltd.) at an acceleration voltage of 15 kV, an irradiation current of 5×10^{-8} A, and a magnification of 1,000 to acquire an element mapping image of Cr. This element mapping image of Cr was made to be an image with a contrast and a color tone so that the regions enriched with Cr (that is, chromium oxide aggregates) could be clearly discriminated as much as possible. The obtained element mapping image of Cr was saved as an image file of bitmap format without degrading the image quality and this image was read separately using image processing software (Win Roof manufactured by Mitani Corporation) to binarize the image. Absolute maximum lengths of the regions enriched with Cr as compared to the matrix were measured by image processing. A threshold value was selected for binarization so that the size of the Cr enriched regions did not change from that of the original image. A scale bar indicated on the original

element mapping image of Cr by EPMA was used for the calibration of length during measurements.

[0048]

Moreover, the targets obtained by the aforementioned methods 1B to 11B of the present invention, the comparative method 1B, and the conventional method 1B were degreased using an organic solvent and were subsequently subjected to vacuum drying by being retained under vacuum at 150°C for 8 hours. Thereafter, the targets were joined with a backing plate made of copper and were mounted on a commercially available sputtering apparatus. A presputtering process was carried out under conditions in which the ultimate vacuum was 5×10^{-5} Pa, the electrical power was 800 W in direct current, the Ar gas pressure was 6.0 Pa, the distance between the target and the substrate was 60 mm, and no substrate heating, to remove the processed layer of the target surface. Then the chamber was temporarily opened to air and the chamber members such as a deposition preventing plate were cleaned. Thereafter, vacuuming was carried out until the above-mentioned vacuum was achieved again. After the vacuuming, a presputtering process was carried out for 30 minutes to remove adsorbed atmospheric components and metal oxide layers, followed by the formation of a magnetic recording film having a thickness of 100 nm on a 4-inch Si wafer. Magnetic recording films having a thickness of 100 nm were formed on a total of 25 pieces of 4-inch Si wafer under the same conditions. With respect to the wafer after the film formation, the number of particles attached on the wafer surface and having a size of 1.0 μm or more was counted using a surface inspection apparatus that was commercially available and the average value of the counts obtained from 25 wafers was calculated. The results are shown in Table 8.

[0049]

[Table 8]

Type	Composition of raw material powder (% by mass)					Presence/absence of Cr oxides having absolute maximum length larger than 10 μm	Number of particles of 1.0 μm or larger	
	Pt-Cr binary alloy powder of Table 6	Pt powder	SiO ₂ powder	Cr powder	Co powder			
Method of present invention	1B	A: 9.4	35.6	6.04	-	Remainder	Absent	65
	2B	B: 11.0	33.9			Remainder	Absent	43
	3B	C: 12.8	32.1			Remainder	Absent	35
	4B	D: 14.9	30.1			Remainder	Absent	37
	5B	E: 17.2	27.7			Remainder	Absent	45
	6B	F: 20.0	25.0			Remainder	Absent	48
	7B	G: 23.1	21.8			Remainder	Absent	46
	8B	H: 26.9	18.0			Remainder	Absent	51
	9B	I: 31.4	13.5			Remainder	Absent	49
	10B	J: 36.9	8.0			Remainder	Absent	54
	11B	K: 43.8	1.1			Remainder	Absent	56
Comparative method 1B	R: 7.9	37.0	Remainder	Present	101			
Conventional method 1B	-	38.3	6.6	Remainder	Present	205		

Pressure sintering process: vacuum hot pressing method

[0050]

From the results shown in Table 8, it is apparent that the targets produced by the aforementioned methods 1B to 11B of the present invention which were produced by blending the Cr-Pt binary alloy powders A to K having a Pt content of 10 to 90 atomic% and a remainder containing Cr as the raw material powders generated less particles as compared to the target produced by the conventional method 1B which was produced by blending and mixing a Co powder having a 50% particle size of 10 μm , a Cr powder having a 50% particle size of 10 μm , a Pt powder having a 50% particle size of 15 μm , and an SiO_2 powder having a 50% particle size of 3 μm without adding a Cr-Pt binary alloy powder. However, it is apparent that the target produced by the comparative method 1B which was produced using the Cr-Pt binary alloy powder R having a composition that was outside the scope of the present invention generated numerous particles, and thus was not preferable.

[0051]

15 Example 6

The Cr-Pt binary alloy powders A to G shown in Table 6, the Co powder, the Pt powder, and the SiO_2 powder were blended so as to give the compositions shown in Table 9 and the obtained blended powders were charged in a 10 L container together with a zirconia ball, which was a grinding medium. The atmosphere inside this container was replaced with an Ar gas atmosphere and thereafter, the container was sealed. This container was rotated for 16 hours using a ball mill to prepare mixed powders. The mixed powders obtained as described above were filled in an SUS container and were subjected to a vacuum degassing treatment under conditions in which the powders were retained at a temperature of 550°C for 12 hours, and thereafter the mixed powders were

vacuum encapsulated by sealing the SUS container. Methods 12B to 18B of the present invention, a comparative method 2B, and a conventional method 2B were conducted as follows. The SUS container filled with the mixed powders was subjected to a hot isostatic pressing process under conditions in which the powders were retained at a temperature of 1,200°C and a pressure of 100 MPa for 3 hours followed by opening the SUS container to produce hot isostatic pressed bodies having a chemical composition formed of 17.1 mol% of Cr, 15.3 mol% of Pt, 10.0 mol% of SiO₂ and a remainder containing Co. These hot isostatic pressed bodies were cut to produce targets having a diameter of 152.4 mm and a thickness of 3 mm. The same measurements as those in Example 5 were conducted on the targets obtained by the aforementioned methods 12B to 18B of the present invention, the comparative method 2B, and the conventional method 2B. The results are shown in Table 9.

[0052]

[Table 9]

Type	Composition of raw material powder (% by mass)					Presence/absence of Cr oxides having absolute maximum length larger than 10 μm	Number of particles of 1.0 μm or larger
	Pt-Cr binary alloy powder of Table 6	Pt powder	SiO ₂ powder	Cr powder	Co powder		
Method of present invention	12B	A: 16.0	7.6	-	Remainder	Absent	67
	13B	B: 18.8			Remainder	Absent	52
	14B	C: 21.9			Remainder	Absent	39
	15B	D: 25.4			Remainder	Absent	38
	16B	E: 29.5			Remainder	Absent	45
	17B	F: 34.1			Remainder	Absent	46
18B	G: 39.6	9.7			Remainder	Absent	44
Comparative method 2B	R: 13.5	35.7			Remainder	Present	112
Conventional method 2B	-	37.9		11.3	Remainder	Present	193

Pressure sintering process: hot isostatic pressing method

From the results shown in Table 9, it is apparent that the targets produced by the aforementioned methods 12B to 18B of the present invention which were produced by blending the Cr-Pt binary alloy powders A to G having a Pt content of 10 to 90 atomic% and a remainder containing Cr as the raw material powders generated less particles as compared to the target produced by the conventional method 2B which was produced by blending and mixing a Co powder having a 50% particle size of 10 μm , a Cr powder having a 50% particle size of 10 μm , a Pt powder having a 50% particle size of 15 μm , and an SiO_2 powder having a 50% particle size of 3 μm without adding a Cr-Pt binary alloy powder. However, it is apparent that the target produced by the comparative method 2B which was produced using the Cr-Pt alloy powder R having a composition that was outside the scope of the present invention generated numerous particles, and thus was not preferable.

[0054]

Example 7

The Cr-Pt binary alloy powders A to J shown in Table 6, the Co-Cr binary alloy powders a to h shown in Table 7, the Co powder, the Pt powder, and the SiO_2 powder were blended so as to give the compositions shown in Table 10 and the obtained blended powders were charged in a 10 L container together with a zirconia ball, which was a grinding medium. The atmosphere inside this container was replaced with an Ar gas atmosphere and thereafter, the container was sealed. This container was rotated for 16 hours using a ball mill to prepare mixed powders.

Methods 19B to 28B of the present invention, a comparative method 3B, and a conventional method 3B were conducted as follows. The obtained mixed powders were filled in a vacuum hot press apparatus and were subjected to a vacuum hot pressing

process in a vacuum atmosphere under conditions in which the powders were retained at a temperature of 1,200°C and a pressure of 15 MPa for 3 hours to produce hot pressed bodies having a chemical composition formed of 11.3 mol% of Cr, 12.2 mol% of Pt, 6.0 mol% of SiO₂ and a remainder containing Co. These hot pressed bodies were cut to
5 produce targets having a diameter of 152.4 mm and a thickness of 3 mm.

[0055]

Absolute maximum lengths (maximum value of the distance between the two arbitrary points on the periphery of the particle) of the chromium oxide aggregates dispersed in the microstructure of the targets produced by the aforementioned methods
10 19B to 28B of the present invention, the comparative method 3B, and the conventional method 3B were measured by an EPMA. The presence/absence of coarse chromium oxide aggregates having an absolute maximum length of more than 10 μm is shown in Table 10.

Measurements of the absolute maximum length of chromium oxide aggregates
15 using an EPMA were conducted by cutting out samples from the targets produced by the aforementioned methods 19B to 28B of the present invention, the comparative method 3B, and the conventional method 3B, and embedding the sections thereof in a resin to be subjected to a mirror polishing process, and the rest of the procedures were carried out as in Example 5.

20 [0056]

Moreover, the targets obtained by the aforementioned methods 19B to 28B of the present invention, the comparative method 3B, and the conventional method 3B were degreased using an organic solvent and were subsequently subjected to vacuum drying by being retained under vacuum at 150°C for 8 hours. Thereafter, the targets were joined

with a backing plate made of copper and were mounted on a commercially available sputtering apparatus. A presputtering process was carried out under the same conditions as those in Example 5 to remove the processed layer of the target surface. Then the chamber was temporarily opened to air and the chamber members such as a deposition preventing plate were cleaned. Thereafter, vacuuming was carried out until the above-mentioned vacuum was achieved again. After the vacuuming, a presputtering process was carried out for 30 minutes to remove adsorbed atmospheric components and metal oxide layers, followed by the formation of a magnetic recording film having a thickness of 100 nm on a 4-inch Si wafer. Magnetic recording films having a thickness of 100 nm were formed on a total of 25 pieces of 4-inch Si wafer under the same conditions. With respect to the wafer after the film formation, the number of particles attached on the wafer surface and having a size of 1.0 μm or more was counted using a surface inspection apparatus that was commercially available and the average value of the counts obtained from 25 wafers was calculated. The results are shown in Table 10.

[0057]

[Table 10]

Type	Composition of raw material powder (% by mass)							Presence/absence of Cr oxides having absolute maximum length larger than 10 μm	Number of particles of 1.0 μm or larger
	Cr-Pt binary alloy powder of Table 6	Co-Cr binary alloy powder of Table 7	Pt powder	SiO ₂ powder	Cr powder	Co powder			
Method of present invention	19B	A: 5.6	d: 6.9	30.2	4.82	-	Remainder	Absent	60
	20B	B: 6.5	h: 5.8	29.3			Remainder	Absent	38
	21B	C: 7.6	a: 8.4	28.2			Remainder	Absent	22
	22B	D: 8.8	e: 6.6	26.9			Remainder	Absent	31
	23B	E: 10.2	g: 6.1	25.5			Remainder	Absent	47
	24B	F: 11.8	b: 7.7	23.9			Remainder	Absent	45
	25B	G: 13.7	c: 7.1	22.0			Remainder	Absent	42
	26B	H: 15.9	f: 6.3	19.8			Remainder	Absent	53
27B	I: 18.6	b: 7.7	17.1	Remainder	Absent	50			
28B	J: 21.9	g: 6.1	13.9	Remainder	Absent	74			
Comparative method 3B	R: 4.7	i: 8.7	31.1	7.8	7.8	Remainder	Present	125	
Conventional method 3B	-	-	31.9			Remainder	Present	201	

Pressure sintering process: vacuum hot pressing method

[0058]

From the results shown in Table 10, it is apparent that the targets produced by the aforementioned methods 19B to 28B of the present invention which were produced by blending the Cr-Pt binary alloy powders shown in Table 6 and the Co-Cr binary alloy powders shown in Table 7 as the raw material powders generated less particles as compared to the target produced by the conventional method 3B shown in Table 10 which was produced by blending and mixing a Co powder having a 50% particle size of 10 μm , a Cr powder having a 50% particle size of 10 μm , a Pt powder having a 50% particle size of 15 μm , and an SiO_2 powder having a 50% particle size of 3 μm without adding a Cr-Pt binary alloy powder and a Co-Cr binary alloy powder. However, it is apparent that the target produced by the comparative method 3B which was produced using the Co-Cr alloy powder i having a composition that was outside the scope of the present invention shown in Table 7 generated numerous particles which were 1.0 μm or larger, and thus was not preferable.

[0059]

Example 8

Methods 29B to 35B of the present invention, a comparative method 4B, and a conventional method 4B were conducted under the same conditions as those in Example 7 except that no Pt powder was used and all the necessary Pt components were included by adding the Cr-Pt binary alloy powders K to Q shown in Table 6 and that a pressure sintering process was conducted by the same hot isostatic pressing process as in Example 6. The hot isostatic pressed bodies having a chemical composition consisting of 11.8 mol% of Cr, 15.5 mol% of Pt, 9.0 mol% of SiO_2 and a remainder containing Co were produced and these hot isostatic pressed bodies were cut to produce targets having a

diameter of 152.4 mm and a thickness of 3 mm. The same measurements as those in Example 5 were conducted on the targets obtained by the aforementioned methods 29B to 35B of the present invention, the comparative method 4B, and the conventional method 4B. The results are shown in Table 11.

5 [0060]
 [Table 11]

Type	Composition of raw material powder (% by mass)						Presence/absence of Cr oxides having absolute maximum length larger than 10 μm	Number of particles of 1.0 μm or larger	
	Pt-Cr binary alloy powder of Table 6	Co-Cr binary alloy powder of Table 7	Pt powder	SiO ₂ powder	Cr powder	Co powder			
Method of present invention	29B	K: 44.8	h: 1.5	6.8	-	-	Remainder	Absent	71
	30B	L: 43.5	g: 3.6				Remainder	Absent	51
	31B	M: 42.4	e: 5.5				Remainder	Absent	45
	32B	N: 41.4	c: 8.0				Remainder	Absent	48
	33B	O: 40.6	a: 11.1				Remainder	Absent	60
	34B	P: 39.9	f: 9.6				Remainder	Absent	64
Comparative method 4B Conventional method 4B	35B	Q: 39.2	d: 11.6	Remainder	Absent	Absent	Absent	69	
		S: 38.6	j: 10.4	Remainder	Present	Present	Present	125	
		-	38.1		7.8	Remainder	Present	194	

Pressure sintering process: hot isostatic pressing method

[0061]

From the results shown in Table 11, it is apparent that the targets produced by the aforementioned methods 29B to 35B of the present invention generated less particles as compared to the target produced by the conventional method 4B which was produced by blending and mixing a Co powder having a 50% particle size of 10 μm , a Cr powder having a 50% particle size of 10 μm , a Pt powder having a 50% particle size of 15 μm , and an SiO_2 powder having a 50% particle size of 3 μm without adding a Cr-Pt binary alloy powder and a Co-Cr binary alloy powder. However, it is apparent that the target produced by the comparative method 4B which was produced using the Cr-Pt binary alloy powder S shown in Table 6 having a composition that was outside the scope of the present invention and the Co-Cr binary alloy powder j shown in Table 7 having a composition that was outside the scope of the present invention generated numerous particles, and thus was not preferable.

[0062]

15 Example 9

The raw material powders were blended so as to give the compositions shown in Table 12 and the obtained blended powders were charged in a 10 L container together with a zirconia ball, which was a grinding medium. The atmosphere inside this container was replaced with an Ar gas atmosphere and thereafter, the container was sealed. This container was rotated for 16 hours using a ball mill to prepare mixed powders. Methods 36B to 44B of the present invention, a comparative method 5B, and a conventional method 5B were conducted as follows. The obtained mixed powders were filled in a vacuum hot press apparatus and were subjected to a vacuum hot pressing process in a vacuum atmosphere under conditions in which the powders were retained at a

temperature of 1,200°C and a pressure of 15 MPa for 3 hours to produce hot pressed bodies. These hot pressed bodies were cut to produce targets having a diameter of 152.4 mm and a thickness of 3 mm as well as a composition consisting of 14.7 mol% of Cr, 16.6 mol% of Pt, 8.0 mol% of TiO₂ and a remainder containing Co.

5 Absolute maximum lengths (maximum value of the distance between the two arbitrary points on the periphery of the particle) of the chromium oxide aggregates dispersed in the microstructure of the targets produced by the aforementioned methods 36B to 44B of the present invention, the comparative method 5B, and the conventional method 5B were measured by an EPMA in the same manner as in Example 5. The
10 presence/absence of coarse chromium oxide aggregates having an absolute maximum length of more than 10 µm is shown in Table 12.

Moreover, the targets obtained by the aforementioned methods 36B to 44B of the present invention, the comparative method 5B, and the conventional method 5B were degreased using an organic solvent and were subsequently subjected to vacuum drying
15 by being retained under vacuum at 150°C for 8 hours. Thereafter, the targets were joined with a backing plate made of copper and were mounted on a commercially available sputtering apparatus. A presputtering process was carried out under the same conditions as those in Example 5. Subsequently, the number of particles attached on the wafer surface and having a size of 1.0 µm or more was counted in the same manner as in
20 Example 5 and the average value of the counts obtained from 25 wafers was calculated. The results are shown in Table 12.

[0063]

[Table 12]

Type	Composition of raw material powder (% by mass)					Presence/absence of Cr oxides having absolute maximum length larger than 10 μm	Number of particles of 1.0 μm or larger	
	Pt-Cr binary alloy powder of Table 6	Pt powder	TiO ₂ powder	Cr powder	Co powder			
Method of present invention	36B	A: 13.2	35.4	7.8	-	Remainder	Absent	60
	37B	B: 15.5	33.2			Remainder	Absent	45
	38B	C: 18.1	30.6			Remainder	Absent	32
	39B	D: 21.0	27.7			Remainder	Absent	35
	40B	E: 24.3	24.3			Remainder	Absent	39
	41B	F: 28.1	20.5			Remainder	Absent	46
	42B	G: 32.6	16.0			Remainder	Absent	48
	43B	H: 37.9	10.7			Remainder	Absent	51
44B	I: 44.3	4.4	Remainder	Absent	55			
Comparative method 5B	R: 11.2	37.5	Remainder	Present	107			
Conventional method 5B	-	39.3	9.3	Remainder	Present	189		

Pressure sintering process: vacuum hot pressing method

[0064]

From the results shown in Table 12, it is apparent that the targets produced by the aforementioned methods 36B to 44B of the present invention which were produced by blending the Cr-Pt binary alloy powders A to K having a Pt content of 10 to 90 atomic% and a remainder containing Cr as the raw material powders generated less particles as compared to the target produced by the conventional method 5B which was produced by blending and mixing a Co powder having a 50% particle size of 10 μm , a Cr powder having a 50% particle size of 10 μm , a Pt powder having a 50% particle size of 15 μm , and an TiO_2 powder having a 50% particle size of 3 μm without adding a Cr-Pt binary alloy powder. However, it is apparent that the target produced by the comparative method 5B which was produced using the Cr-Pt binary alloy powder R having a composition that was outside the scope of the present invention generated numerous particles, and thus was not preferable.

[0065]

Example 10

The Cr-Pt binary alloy powders A to G shown in Table 6, the Co powder, the Pt powder, and the TiO_2 powder were blended so as to give the compositions shown in Table 13 and the obtained blended powders were charged in a 10 L container together with a zirconia ball, which was a grinding medium. The atmosphere inside this container was replaced with an Ar gas atmosphere and thereafter, the container was sealed. This container was rotated for 16 hours using a ball mill to prepare mixed powders. The mixed powders obtained as described above were filled in an SUS container and were subjected to a vacuum degassing treatment under conditions in which the powders were retained at a temperature of 550°C for 12 hours, and thereafter the mixed powders were

vacuum encapsulated by sealing the SUS container. Methods 45B to 53B of the present invention, a comparative method 6B, and a conventional method 6B were conducted as follows. The SUS container filled with the mixed powders was subjected to a hot isostatic pressing process under conditions in which the powders were retained at a

5 temperature of 1,200°C and a pressure of 100 MPa for 3 hours followed by opening the SUS container to produce hot isostatic pressed bodies having a chemical composition consisting of 13.5 mol% of Cr, 14.4 mol% of Pt, 10.0 mol% of TiO₂ and a remainder containing Co. These hot isostatic pressed bodies were cut to produce targets having a diameter of 152.4 mm and a thickness of 3 mm. The same measurements as those in

10 Example 5 were conducted on the targets obtained by the aforementioned methods 45B to 53B of the present invention, the comparative method 6B, and the conventional method 6B. The results are shown in Table 13.

[0066]

[Table 13]

Type	Composition of raw material powder (% by mass)					Presence/absence of Cr oxides having absolute maximum length larger than 10 μm	Number of particles of 1.0 μm or larger	
	Pt-Cr binary alloy powder of Table 6	Pt powder	TiO ₂ powder	Cr powder	Co powder			
Method of present invention	45B	A: 12.5	31.6	10.0	-	Remainder	Absent	62
	46B	B: 14.6	29.4			Remainder	Absent	48
	47B	C: 17.1	27.0			Remainder	Absent	42
	48B	D: 19.8	24.2			Remainder	Absent	36
	49B	E: 23.0	21.1			Remainder	Absent	37
	50B	F: 26.6	17.5			Remainder	Absent	43
	51B	G: 30.8	13.2			Remainder	Absent	48
	52B	H: 35.8	8.2			Remainder	Absent	52
	53B	I: 41.9	2.2			Remainder	Absent	51
Comparative method 6B	R: 10.5	33.5	8.8		Remainder	Present	108	
Conventional method 6B	-	35.3			Remainder	Present	183	

Pressure sintering process: hot isostatic pressing method

[0067]

From the results shown in Table 13, it is apparent that the targets produced by the
aforementioned methods 45B to 53B of the present invention which were produced by
5 blending the Cr-Pt binary alloy powders A to G having a Pt content of 10 to 90 atomic%
and a remainder containing Cr as the raw material powders generated less particles as
compared to the target produced by the conventional method 6B which was produced by
blending and mixing a Co powder having a 50% particle size of 10 μm , a Cr powder
having a 50% particle size of 10 μm , a Pt powder having a 50% particle size of 15 μm ,
10 and an TiO_2 powder having a 50% particle size of 3 μm without adding a Cr-Pt binary
alloy powder. However, it is apparent that the target produced by the comparative
method 6B which was produced using the Cr-Pt alloy powder R having a composition
that was outside the scope of the present invention generated numerous particles, and
thus was not preferable.

15 [0068]

Example 11

The Cr-Pt binary alloy powders A to J shown in Table 6, the Co-Cr binary alloy
powders a to h shown in Table 7, the Co powder, the Pt powder, and the TiO_2 powder
were blended so as to give the compositions shown in Table 14 and the obtained blended
20 powders were charged in a 10 L container together with a zirconia ball, which was a
grinding medium. The atmosphere inside this container was replaced with an Ar gas
atmosphere and thereafter, the container was sealed. This container was rotated for 16
hours using a ball mill to prepare mixed powders.

Methods 54B to 63B of the present invention, a comparative method 7B, and a conventional method 7B were conducted as follows. The obtained mixed powders were filled in a vacuum hot press apparatus and were subjected to a vacuum hot pressing process in a vacuum atmosphere under conditions in which the powders were retained at a temperature of 1,200°C and a pressure of 15 MPa for 3 hours to produce hot pressed bodies having a chemical composition formed of 13.2 mol% of Cr, 12.2 mol% of Pt, 6.0 mol% of TiO₂ and a remainder containing Co. These hot pressed bodies were cut to produce targets having a diameter of 152.4 mm and a thickness of 3 mm.

[0069]

Absolute maximum lengths (maximum value of the distance between the two arbitrary points on the periphery of the particle) of the chromium oxide aggregates dispersed in the microstructure of the targets produced by the aforementioned methods 54B to 63B of the present invention, the comparative method 7B, and the conventional method 7B were measured by an EPMA. The presence/absence of coarse chromium oxide aggregates having an absolute maximum length of more than 10 μm is shown in Table 14.

Measurements of the absolute maximum length of chromium oxide aggregates using an EPMA were conducted by cutting out samples from the targets produced by the aforementioned methods 54B to 63B of the present invention, the comparative method 7B, and the conventional method 7B, and embedding the sections thereof in a resin to be subjected to a mirror polishing process, and the rest of the procedures were carried out in the same manner as in Example 5.

[0070]

Moreover, the targets obtained by the aforementioned methods 54B to 63B of the present invention, the comparative method 7B, and the conventional method 7B were degreased using an organic solvent and were subsequently subjected to vacuum drying by being retained under vacuum at 150°C for 8 hours. Thereafter, the targets were joined
5 with a backing plate made of copper and were mounted on a commercially available sputtering apparatus. A presputtering process was carried out under the same conditions as those in Example 5 to remove the processed layer of the target surface. Then the chamber was temporarily opened to air and the chamber members such as a deposition preventing plate were cleaned. Thereafter, vacuuming was carried out until the above-
10 mentioned vacuum was achieved again. After the vacuuming, a presputtering process was carried out for 30 minutes to remove adsorbed atmospheric components and metal oxide layers, followed by the formation of a magnetic recording film having a thickness of 100 nm on a 4-inch Si wafer. Magnetic recording films having a thickness of 100 nm were formed on a total of 25 pieces of 4-inch Si wafer under the same conditions. With
15 respect to the wafer after the film formation, the number of particles attached on the wafer surface and having a size of 1.0 μm or more was counted using a surface inspection apparatus that was commercially available and the average value of the counts obtained from 25 wafers was calculated. The results are shown in Table 14.

[0071]

20 [Table 14]

Type	Composition of raw material powder (% by mass)						Presence/absence of Cr oxides having absolute maximum length larger than 10 μm	Number of particles of 1.0 μm or larger	
	Cr-Pt binary alloy powder of Table 6	Co-Cr binary alloy powder of Table 7	Pt powder	TiO ₂ powder	Cr powder	Co powder			
Method of present invention	54B	A: 6.4	d: 7.9	29.5	6.3	-	Remainder	58	
	55B	B: 7.5	h: 6.7	28.4			Remainder	Absent	45
	56B	C: 8.7	a: 9.6	27.2			Remainder	Absent	34
	57B	D: 10.1	e: 7.6	25.8			Remainder	Absent	29
	58B	E: 11.8	g: 7.0	24.2			Remainder	Absent	33
	59B	F: 13.6	b: 8.9	22.3			Remainder	Absent	39
	60B	G: 15.8	c: 8.2	20.1			Remainder	Absent	44
	61B	H: 18.3	f: 7.3	17.6			Remainder	Absent	45
	62B	I: 21.4	b: 8.9	14.5			Remainder	Absent	51
	63B	J: 25.2	g: 7.0	10.7			Remainder	Absent	62
Comparative method 7B		R: 5.4	i: 10.0	30.5	9.0		Remainder	Present	112
Conventional method 7B		-	-	31.4			Remainder	Present	190

Pressure sintering process: vacuum hot pressing method

[0072]

From the results shown in Table 14, it is apparent that the targets produced by the aforementioned methods 54B to 63B of the present invention which were produced by blending the Cr-Pt binary alloy powders shown in Table 6 and the Co-Cr binary alloy
5 powders shown in Table 7 as the raw material powders generated less particles as compared to the target produced by the conventional method 7B which was produced by blending and mixing a Co powder having a 50% particle size of 10 μm , a Cr powder having a 50% particle size of 10 μm , a Pt powder having a 50% particle size of 15 μm , and an TiO_2 powder having a 50% particle size of 3 μm without adding the Cr-Pt binary
10 alloy powder and Co-Cr binary alloy powder shown in Table 14. However, it is apparent that the target produced by the comparative method 7B which was produced using the Co-Cr alloy powder i having a composition that was outside the scope of the present invention shown in Table 7 generated numerous particles which were 1.0 μm or larger, and thus was not preferable.

15 [0073]

Example 12

Methods 64B to 70B of the present invention, a comparative method 8B, and a conventional method 8B were conducted with exactly the same conditions as those in Example 7 except that no Pt powder was used and all the necessary Pt components were
20 included by adding the Cr-Pt binary alloy powders K to Q shown in Table 6, a TiO_2 powder was used as a non-magnetic oxide powder, and that a pressure sintering process was conducted by the same hot isostatic pressing process as in Example 6. The hot isostatic pressed bodies having a chemical composition consisting of 9.1 mol% of Cr, 10.9 mol% of Pt, 9.0 mol% of TiO_2 and a remainder containing Co were produced and

these hot isostatic pressed bodies were cut to produce targets having a diameter of 152.4 mm and a thickness of 3 mm. The same measurements as those in Example 5 were conducted on the targets obtained by the aforementioned methods 64B to 70B of the present invention, the comparative method 8B, and the conventional method 8B. The results are shown in Table 15.

[0074]

[Table 15]

Type	Composition of raw material powder (% by mass)						Presence/absence of Cr oxides having absolute maximum length larger than 10 μm	Number of particles of 1.0 μm or larger	
	Pt-Cr binary alloy powder of Table 6	Co-Cr binary alloy powder of Table 7	Pt powder	TiO ₂ powder	Cr powder	Co powder			
Method of present invention	64B	K: 33.4	h: 1.9	9.6	-	-	Remainder	Absent	69
	65B	L: 32.5	g: 3.5				Remainder	Absent	55
	66B	M: 31.6	e: 4.9				Remainder	Absent	49
	67B	N: 30.9	c: 6.9				Remainder	Absent	42
	68B	O: 30.3	a: 9.4				Remainder	Absent	50
	69B	P: 29.7	f: 8.0				Remainder	Absent	53
	70B	Q: 29.2	d: 9.6				Remainder	Absent	61
Comparative method 8B	S: 28.8	i: 8.5	28.4	-	6.3	Remainder	Present	121	
Conventional method 8B	-	-				Remainder	Present	185	

Pressure sintering process: hot isostatic pressing method

[0075]

From the results shown in Table 15, it is apparent that the targets produced by the aforementioned methods 64B to 70B of the present invention generated less particles as compared to the target produced by the conventional method 8B which was produced by
5 blending and mixing a Co powder having a 50% particle size of 10 μm , a Cr powder having a 50% particle size of 10 μm , a Pt powder having a 50% particle size of 15 μm , and an TiO_2 powder having a 50% particle size of 3 μm without adding a Cr-Pt binary alloy powder and a Co-Cr binary alloy powder. However, it is apparent that the target produced by the comparative method 8B which was produced using the Cr-Pt binary
10 alloy powder S shown in Table 6 having a composition that was outside the scope of the present invention and the Co-Cr binary alloy powder j shown in Table 7 having a composition that was outside the scope of the present invention generated numerous particles, and thus was not preferable.

[0076]

15 Example 13

The raw material powders were blended so as to give the compositions shown in Table 16 and the obtained blended powders were charged in a 10 L container together with a zirconia ball, which was a grinding medium. The atmosphere inside this container was replaced with an Ar gas atmosphere and thereafter, the container was sealed. This
20 container was rotated for 16 hours using a ball mill to prepare mixed powders. Methods 71B to 79B of the present invention, a comparative method 9B, and a conventional method 9B were conducted as follows. The obtained mixed powders were filled in a vacuum hot press apparatus and were subjected to a vacuum hot pressing process in a vacuum atmosphere under conditions in which the powders were retained at a

temperature of 1,200°C and a pressure of 15 MPa for 3 hours to produce hot pressed bodies. These hot pressed bodies were cut to produce targets having a diameter of 152.4 mm and a thickness of 3 mm as well as a chemical composition consisting of 10.1 mol% of Cr, 15.6 mol% of Pt, 8.0 mol% of Ta₂O₅ and a remainder containing Co.

5 Absolute maximum lengths (maximum value of the distance between the two arbitrary points on the periphery of the particle) of the chromium oxide aggregates dispersed in the microstructure of the targets produced by the aforementioned methods 71B to 79B of the present invention, the comparative method 9B, and the conventional method 9B were measured by an EPMA in the same manner as in Example 1. The
10 presence/absence of coarse chromium oxide aggregates having an absolute maximum length of more than 10 µm is shown in Table 16.

Moreover, the targets obtained by the aforementioned methods 71B to 79B of the present invention, the comparative method 9B, and the conventional method 9B were degreased using an organic solvent and were subsequently subjected to vacuum drying
15 by being retained under vacuum at 150°C for 8 hours. Thereafter, the targets were joined with a backing plate made of copper and were mounted on a commercially available sputtering apparatus. A presputtering process was carried out under the same conditions as those in Example 5. Subsequently, the number of particles attached on the wafer surface and having a size of 1.0 µm or more was counted in the same manner as in
20 Example 5 and the average value of the counts obtained from 25 wafers was calculated. The results are shown in Table 16.

[0077]

[Table 16]

Type	Composition of raw material powder (% by mass)					Presence/absence of Cr oxides having absolute maximum length larger than 10 μm	Number of particles of 1.0 μm or larger
	Pt-Cr binary alloy powder of Table 6	Pt powder	Ta ₂ O ₅ powder	Cr powder	Co powder		
Method of present invention	71B	A: 10.5	18.8	-	Remainder	Absent	76
	72B	B: 12.3			Remainder	Absent	45
	73B	C: 14.4			Remainder	Absent	20
	74B	D: 16.7			Remainder	Absent	25
	75B	E: 19.3			Remainder	Absent	31
	76B	F: 22.4			Remainder	Absent	36
	77B	G: 26.0			Remainder	Absent	39
	78B	H: 30.2			Remainder	Absent	42
	79B	I: 35.2			Remainder	Absent	45
Comparative method 9B	R: 8.9	30.3	7.4		Remainder	Present	103
Conventional method 9B	-	31.8			Remainder	Present	165

Pressure sintering process: vacuum hot pressing method

[0078]

From the results shown in Table 16, it is apparent that the targets produced by the aforementioned methods 71B to 79B of the present invention which were produced by blending the Cr-Pt binary alloy powders A to K having a Pt content of 10 to 90 atomic% and a remainder containing Cr as the raw material powders generated less particles as compared to the target produced by the conventional method 9B which was produced by blending and mixing a Co powder having a 50% particle size of 10 μm , a Cr powder having a 50% particle size of 10 μm , a Pt powder having a 50% particle size of 15 μm , and an Ta_2O_5 powder having a 50% particle size of 3 μm without adding a Cr-Pt binary alloy powder. However, it is apparent that the target produced by the comparative method 9B which was produced using the Cr-Pt binary alloy powder R having a composition that was outside the scope of the present invention generated numerous particles, and thus was not preferable.

[0079]

Example 14

The Cr-Pt binary alloy powders A to G shown in Table 6, the Co powder, the Pt powder, and the Ta_2O_5 powder were blended so as to give the compositions shown in Table 17 and the obtained blended powders were charged in a 10 L container together with a zirconia ball, which was a grinding medium. The atmosphere inside this container was replaced with an Ar gas atmosphere and thereafter, the container was sealed. This container was rotated for 16 hours using a ball mill to prepare mixed powders. The mixed powders obtained as described above were filled in an SUS container and were subjected to a vacuum degassing treatment under conditions in which the powders were retained at a temperature of 550°C for 12 hours, and thereafter the mixed powders were

vacuum encapsulated by sealing the SUS container. Methods 80B to 88B of the present invention, a comparative method 10B, and a conventional method 10B were conducted as follows. The SUS container filled with the mixed powders was subjected to a hot isostatic pressing process under conditions in which the powders were retained at a
5 temperature of 1,200°C and a pressure of 100 MPa for 3 hours followed by opening the SUS container to produce hot isostatic pressed bodies having a chemical composition consisting of 13.6 mol% of Cr, 14.6 mol% of Pt, 3.0 mol% of Ta₂O₅ and a remainder containing Co. These hot isostatic pressed bodies were cut to produce targets having a diameter of 152.4 mm and a thickness of 3 mm. The same measurements as those in
10 Example 5 were conducted on the targets obtained by the aforementioned methods 80B to 88B of the present invention, the comparative method 10B, and the conventional method 10B. The results are shown in Table 17.

[0080]

[Table 17]

Type	Composition of raw material powder (% by mass)					Presence/absence of Cr oxides having absolute maximum length larger than 10 μm	Number of particles of 1.0 μm or larger	
	Pt-Cr binary alloy powder of Table 6	Pt powder	Ta ₂ O ₅ powder	Cr powder	Co powder			
Method of present invention	80B	A: 11.2	28.5	14.9	-	Remainder	Absent	72
	81B	B: 13.1	26.6			Remainder	Absent	52
	82B	C: 15.3	24.4			Remainder	Absent	43
	83B	D: 17.8	21.9			Remainder	Absent	76
	84B	E: 20.6	19.1			Remainder	Absent	32
	85B	F: 23.9	15.8			Remainder	Absent	44
	86B	G: 27.7	12.0			Remainder	Absent	47
	87B	H: 32.2	7.5			Remainder	Absent	51
88B	I: 37.6	2.1	Remainder	Absent	50			
Comparative method 10B	R: 9.5	30.2				Remainder	Present	115
Conventional method 10B	-	31.8	7.9			Remainder	Present	172

Pressure sintering process: hot isostatic pressing method

[0081]

From the results shown in Table 17, it is apparent that the targets produced by the aforementioned methods 80B to 88B of the present invention which were produced by

blending the Cr-Pt binary alloy powders A to G having a Pt content of 10 to 90 atomic% and a remainder containing Cr as the raw material powders generated less particles as compared to the target produced by the conventional method 10B which was produced by blending and mixing a Co powder having a 50% particle size of 10 μm , a Cr powder
5 having a 50% particle size of 10 μm , a Pt powder having a 50% particle size of 15 μm , and an Ta_2O_5 powder having a 50% particle size of 3 μm without adding a Cr-Pt binary alloy powder. However, it is apparent that the target produced by the comparative method 10B which was produced using the Cr-Pt alloy powder R having a composition that was outside the scope of the present invention generated numerous particles, and
10 thus was not preferable.

[0082]

Example 15

The Cr-Pt binary alloy powders A to J shown in Table 6, the Co-Cr binary alloy powders a to h shown in Table 7, the Co powder, the Pt powder, and the Ta_2O_5 powder
15 were blended so as to give the compositions shown in Table 18 and the obtained blended powders were charged in a 10 L container together with a zirconia ball, which was a grinding medium. The atmosphere inside this container was replaced with an Ar gas atmosphere and thereafter, the container was sealed. This container was rotated for 16 hours using a ball mill to prepare mixed powders.

20 Methods 89B to 98B of the present invention, a comparative method 11B, and a conventional method 11B were conducted as follows. The obtained mixed powders were filled in a vacuum hot press apparatus and were subjected to a vacuum hot pressing process in a vacuum atmosphere under conditions in which the powders were retained at a temperature of 1,200°C and a pressure of 15 MPa for 3 hours to produce hot pressed

bodies having a chemical composition consisting of 14.7 mol% of Cr, 16.7 mol% of Pt, 2.0 mol% of Ta₂O₅ and a remainder containing Co. These hot pressed bodies were cut to produce targets having a diameter of 152.4 mm and a thickness of 3 mm.

[0083]

5 Absolute maximum lengths (maximum value of the distance between the two arbitrary points on the periphery of the particle) of the chromium oxide aggregates dispersed in the microstructure of the targets produced by the aforementioned methods 89B to 98B of the present invention, the comparative method 11B, and the conventional method 11B were measured by an EPMA. The presence/absence of coarse chromium
10 oxide aggregates having an absolute maximum length of more than 10 μm is shown in Table 18.

Measurements of the absolute maximum length of chromium oxide aggregates using an EPMA were conducted by cutting out samples from the targets produced by the aforementioned methods 89B to 98B of the present invention, the comparative method
15 11B, and the conventional method 11B, and embedding the sections thereof in a resin to be subjected to a mirror polishing process, and the rest of the procedures were carried out in the same manner as in Example 5.

[0084]

Moreover, the targets obtained by the aforementioned methods 89B to 98B of the
20 present invention, the comparative method 11B, and the conventional method 11B were degreased using an organic solvent and were subsequently subjected to vacuum drying by being retained under vacuum at 150°C for 8 hours. Thereafter, the targets were joined with a backing plate made of copper and were mounted on a commercially available sputtering apparatus. A presputtering process was carried out under the same conditions

as those in Example 5 to remove the processed layer of the target surface. Then the chamber was temporarily opened to air and the chamber members such as a deposition preventing plate were cleaned. Thereafter, vacuuming was carried out until the above-mentioned vacuum was achieved again. After the vacuuming, a presputtering process
5 was carried out for 30 minutes to remove adsorbed atmospheric components and metal oxide layers, followed by the formation of a magnetic recording film having a thickness of 100 nm on a 4-inch Si wafer. Magnetic recording films having a thickness of 100 nm were formed on a total of 25 pieces of 4-inch Si wafer under the same conditions. With respect to the wafer after the film formation, the number of particles attached on the
10 wafer surface and having a size of 1.0 μm or more was counted using a surface inspection apparatus that was commercially available and the average value of the counts obtained from 25 wafers was calculated. The results are shown in Table 18.

[0085]

[Table 18]

Type	Composition of raw material powder (% by mass)						Presence/absence of Cr oxides having absolute maximum length larger than 10 μm	Number of particles of 1.0 μm or larger
	Cr-Pt binary alloy powder of Table 6	Co-Cr binary alloy powder of Table 7	Pt powder	Ta ₂ O ₅ powder	Cr powder	Co powder		
Method of present invention	89B A: 6.1	d: 7.6	35.0	10.1	-	Remainder	Absent	68
	90B B: 7.2	h: 6.4	34.0			Remainder	Absent	61
	91B C: 8.4	a: 9.2	32.8			Remainder	Absent	54
	92B D: 9.7	e: 7.3	31.4			Remainder	Absent	46
	93B E: 11.3	g: 6.7	29.9			Remainder	Absent	37
	94B F: 13.1	b: 8.5	28.1			Remainder	Absent	41
	95B G: 15.2	c: 7.9	26.0			Remainder	Absent	43
	96B H: 17.6	f: 7.0	23.5			Remainder	Absent	49
	97B I: 20.6	b: 8.5	20.6			Remainder	Absent	52
	98B J: 24.2	g: 6.7	17.0			Remainder	Absent	57
Comparative method 11B	R: 5.2	i: 9.6	36.0	8.7		Remainder	Present	110
Conventional method 11B	-	-	36.8			Remainder	Present	201

Pressure sintering process: vacuum hot pressing method

[0086]

From the results shown in Table 18, it is apparent that the targets produced by the
aforementioned methods 89B to 98B of the present invention which were produced by
5 blending the Cr-Pt binary alloy powders shown in Table 6 and the Co-Cr binary alloy
powders shown in Table 7 as the raw material powders generated less particles as
compared to the target produced by the conventional method 11B which was produced
by blending and mixing a Co powder having a 50% particle size of 10 μm , a Cr powder
having a 50% particle size of 10 μm , a Pt powder having a 50% particle size of 15 μm ,
10 and an TiO_2 powder having a 50% particle size of 3 μm without adding the Cr-Pt binary
alloy powder and Co-Cr binary alloy powder shown in Table 18. However, it is apparent
that the target produced by the comparative method 11B which was produced using the
Co-Cr alloy powder i having a composition that was outside the scope of the present
invention shown in Table 7 generated numerous particles which were 1.0 μm or larger,
15 and thus was not preferable.

[0087]

Example 16

Methods 99B to 105B of the present invention, a comparative method 12B, and a
conventional method 12B were conducted with exactly the same conditions as those in
20 Example 7 except that no Pt powder was used and all the necessary Pt components were
included by adding the Cr-Pt binary alloy powders K to Q shown in Table 6, a Ta_2O_5
powder was used as a non-magnetic oxide powder, and that a pressure sintering process
was conducted by the same hot isostatic pressing process as in Example 6. The hot
isostatic pressed bodies having a composition consisting of 17.5 mol% of Cr, 19.4 mol%

of Pt, 3.0 mol% of Ta₂O₅ and a remainder containing Co were produced and these hot isostatic pressed bodies were cut to produce targets having a diameter of 152.4 mm and a thickness of 3 mm. The same measurements as those in Example 5 were conducted on the targets obtained by the aforementioned methods 99B to 105B of the present invention, 5 the comparative method 12B, and the conventional method 12B. The results are shown in Table 19.

[0088]

[Table 19]

Type	Composition of raw material powder (% by mass)						Presence/absence of Cr oxides having absolute maximum length larger than 10 μm	Number of particles of 1.0 μm or larger	
	Pt-Cr binary alloy powder of Table 6	Co-Cr binary alloy powder of Table 7	Pt powder	Ta ₂ O ₅ powder	Cr powder	Co powder			
Method of present invention	99B	K: 46.6	h: 3.7	13.9	-	-	Remainder	Absent	74
	100B	L: 45.3	g: 5.9				Remainder	Absent	63
	101B	M: 44.1	e: 8.0				Remainder	Absent	52
	102B	N: 43.1	c: 10.9				Remainder	Absent	47
	103B	O: 42.2	a: 14.6				Remainder	Absent	50
	104B	P: 41.4	f: 12.3				Remainder	Absent	55
Comparative method 12B	105B	Q: 40.7	d: 14.6	Remainder	Absent	59	Present	106	
	S: 40.1		j: 12.9	Remainder					
Conventional method 12B	-	-	39.6	9.5	Remainder	192			

Pressure sintering process: hot isostatic pressing method

[0089]

From the results shown in Table 19, it is apparent that the targets produced by the
aforementioned methods 99B to 105B of the present invention generated less particles as
compared to the target produced by the conventional method 12B which was produced
5 by blending and mixing a Co powder having a 50% particle size of 10 μm , a Cr powder
having a 50% particle size of 10 μm , a Pt powder having a 50% particle size of 15 μm ,
and an Ta_2O_5 powder having a 50% particle size of 3 μm without adding a Cr-Pt binary
alloy powder and a Co-Cr binary alloy powder. However, it is apparent that the target
produced by the comparative method 12B which was produced using the Cr-Pt binary
10 alloy powder S shown in Table 6 having a composition that was outside the scope of the
present invention and the Co-Cr binary alloy powder j shown in Table 7 having a
composition that was outside the scope of the present invention generated numerous
particles, and thus was not preferable.

[0090]

15 <Third aspect>

Co-Cr alloy powders A to J having chemical compositions shown in Table 20
were prepared as raw material powders by a gas atomizing method. Since the Co-Cr
alloy powders A to J obtained by the gas atomizing method had a 50% particle size of 95
 μm , the Co-Cr alloy powders A to J were classified using a sieve with an aperture size of
20 45 μm so that the 50% particle size of all the powders measured by a laser diffraction
method would be 35 μm . Moreover, a Co powder having a 50% particle size of 10 μm , a
Pt powder having a 50% particle size of 15 μm , an SiO_2 powder having a 50% particle
size of 3 μm , a TiO_2 powder having a 50% particle size of 3 μm , a Ta_2O_5 powder having

a 50% particle size of 3 μm , and a Cr powder having a 50% particle size of 10 μm which were commercially available were prepared.

[0091]

[Table 20]

Type		50% particle size (μm)	Composition (atomic%)	
			Cr	Co
Co-Cr alloy powder	A	35	50	Remainder
	B		54	Remainder
	C		58	Remainder
	D		60	Remainder
	E		62	Remainder
	F		65	Remainder
	G		67	Remainder
	H		70	Remainder
	I		48	Remainder
	J		72	Remainder

[0092]

Example 17

The raw material powders prepared above were blended so as to give the compositions shown in Table 21 and the obtained blended powders were charged in a 10 L container together with a zirconia ball, which was a grinding medium. The atmosphere inside this container was replaced with an Ar gas atmosphere and thereafter, the container was sealed. This container was rotated for 16 hours using a ball mill to prepare mixed powders.

The obtained mixed powders were filled in a vacuum hot press apparatus and were subjected to a vacuum hot pressing process in a vacuum atmosphere under conditions in which the powders were retained at a temperature of 1,200°C and a pressure of 15 MPa for 3 hours to produce hot pressed bodies having the compositions shown in Table 21. These hot pressed bodies were cut to produce targets 1C to 8C of the

present invention, comparative targets 1C and 2C, and a conventional target 1C having a diameter of 152.4 mm and a thickness of 3 mm.

[0093]

Absolute maximum lengths (maximum value of the distance between the two
5 arbitrary points on the periphery of the particle) of the chromium oxide aggregates
dispersed in the microstructure of the aforementioned targets 1C to 8C of the present
invention, the comparative targets 1C and 2C, and the conventional target 1C were
measured by an EPMA. The number of chromium oxide aggregates having an absolute
maximum length of more than 5 μm and the presence/absence of coarse chromium oxide
10 aggregates having an absolute maximum length of more than 10 μm are shown in Table
21.

Measurements of the absolute maximum length of chromium oxide aggregates
using an EPMA were conducted as follows. Samples were cut out from the hot pressed
bodies of the aforementioned targets 1C to 8C of the present invention, the comparative
15 targets 1C and 2C, and the conventional target 1C and the sections thereof were
embedded in a resin to be subjected to a mirror polishing process. Surface analysis was
conducted on the structures of these sections using a field emission EPMA (JXA-8500F
manufactured by JEOL Ltd.) to acquire an element mapping image of Cr. Conditions for
the surface analysis were an acceleration voltage of 15 kV and an irradiation current of 5
20 $\times 10^{-8}$ A. The Cr mapping image had pixel sizes of 0.5 μm in both X and Y directions
and 800 pixels in both X and Y directions. Hence, the analytical range using this Cr
mapping image was 400 $\mu\text{m} \times 400 \mu\text{m}$. Measuring time was 0.015 seconds and
integration frequency was once. This element mapping image of Cr was made to be an
image with a contrast and a color tone so that the regions enriched with Cr (that is,

chromium oxide aggregates) can be clearly discriminated as much as possible. The obtained element mapping image of Cr was saved as an image file of bitmap format without degrading the image quality and this image was read separately using image processing software (Win Roof manufactured by Mitani Corporation) to binarize the image. Absolute maximum lengths of the regions enriched with Cr as compared to the matrix were measured by image processing. A threshold value was selected for binarization so that the size of the Cr enriched regions did not change from that of the original image. A scale bar indicated on the original element mapping image of Cr by EPMA was used for the calibration of length during measurements. Sampling was conducted from 10 randomly selected points in each target. The composition of chromium oxide aggregates was 30 to 50 atomic% of Cr and 50 to 70 atomic% of oxygen and a remainder containing Co, Pt, and the metal elements constituting the non-magnetic oxide.

[0094]

Moreover, the aforementioned targets 1C to 8C of the present invention, the comparative targets 1C and 2C, and the conventional target 1C were degreased using an organic solvent and were subsequently subjected to vacuum drying by being retained under vacuum at 150°C for 8 hours. Thereafter, the targets were joined with a backing plate made of copper and were mounted on a commercially available sputtering apparatus. A presputtering process was carried out under the conditions in which the ultimate vacuum was 5×10^{-5} Pa, the electrical power was 800 W in direct current, the Ar gas pressure was 6.0 Pa, the distance between the target and the substrate was 60 mm, and no substrate heating, to remove the processed layer of the target surface. Then the chamber was temporarily opened to air and the chamber members such as a deposition

preventing plate were cleaned. Thereafter, vacuuming was carried out until the above-mentioned vacuum was achieved again. After the vacuuming, a presputtering process was carried out for 30 minutes to remove adsorbed atmospheric components and metal oxide layers, followed by the formation of a magnetic recording film having a thickness
5 of 100 nm on a 4-inch Si wafer. Magnetic recording films having a thickness of 100 nm were formed on a total of 25 pieces of 4-inch Si wafer under the same conditions. With respect to the wafer after the film formation, the number of particles attached on the wafer surface and having a size of 1.0 μm or more was counted using a surface inspection apparatus that was commercially available and the average value of the counts
10 obtained from 25 wafers was calculated. The results are shown in Table 21.

[0095]

[Table 21]

Target	Composition of raw material powder (% by mass)						Composition of target (mol%)				Number of Cr oxide aggregates having absolute maximum length larger than 5 μm (aggregates/ mm^2)	Presence/absence of Cr oxide aggregates having absolute maximum length larger than 10 μm	Number of particles
	Alloy powder of Table 20						Cr	Pt	SiO ₂	Co			
	Pt powder	SiO ₂ powder	Cr powder	Co powder									
Present invention	1C	A: 14.9	39.3	7.5	-	Remainder	10.8	16.2	10.0	Remainder	Absent	54	
	2C	B: 13.7				Remainder				152	Absent	39	
	3C	C: 12.7				Remainder				307	Absent	50	
	4C	D: 12.3				Remainder				164	Absent	40	
	5C	E: 11.8				Remainder				294	Absent	49	
	6C	F: 11.3				Remainder				320	Absent	51	
	7C	G: 10.9				Remainder				403	Absent	68	
	8C	H: 10.4				Remainder				459	Absent	83	
Comparative target	1C	I: 15.6	-	-	-	Remainder	-	-	-	509*	Present	119	
	2C	J: 10.1				Remainder				532*	Present	136	
Conventional target 1C		-	-			Remainder	-			621*	Present	180	

Symbols (*) indicate conditions outside the scope of the present invention.

[0096]

From the results shown in Table 21, it is apparent that the targets 1C to 8C of the present invention generated less particles as compared to the conventional target 1C. Moreover, it is apparent that the comparative targets 1C and 2C generated numerous
5 particles, and thus were not preferable.

[0097]

Example 18

The raw material powders prepared above were blended so as to give the compositions shown in Table 22 and the obtained blended powders were charged in a 10
L container together with a zirconia ball, which was a grinding medium. The atmosphere inside this container was replaced with an Ar gas atmosphere and thereafter, the container was sealed. This container was rotated for 16 hours using a ball mill to prepare mixed powders.

The obtained mixed powders were filled in an SUS container and were subjected
15 to a vacuum degassing treatment under conditions in which the powders were retained at a temperature of 550°C for 12 hours, and thereafter the mixed powders were vacuum encapsulated by sealing the SUS container. The SUS container filled with the mixed powders was subjected to a hot isostatic pressing process under conditions in which the powders were retained at a temperature of 1,200°C and a pressure of 100 MPa for 3
20 hours followed by opening the SUS container to produce hot isostatic pressed bodies having the compositions shown in Table 22. These hot isostatic pressed bodies were cut to produce targets 9C to 16C of the present invention, comparative targets 3C and 4C, and a conventional target 2C having a diameter of 152.4 mm and a thickness of 3 mm.

[0098]

Absolute maximum lengths (maximum value of the distance between the two arbitrary points on the periphery of the particle) of the chromium oxide aggregates dispersed in the microstructure of the aforementioned targets 9C to 16C of the present invention, the comparative targets 3C and 4C, and the conventional target 2C were measured by an EPMA. The number of chromium oxide aggregates having an absolute maximum length of more than 5 μm and the presence/absence of coarse chromium oxide aggregates having an absolute maximum length of more than 10 μm are shown in Table 19. The method for measuring chromium oxide aggregates was the same as that employed in Example 17.

[0099]

Moreover, the aforementioned targets 9C to 16C of the present invention, the comparative targets 3C and 4C, and the conventional target 2C were degreased using an organic solvent and were subsequently subjected to vacuum drying by being retained under vacuum at 150°C for 8 hours. Thereafter, the targets were joined with a backing plate made of copper and were mounted on a commercially available sputtering apparatus. A presputtering process was carried out under the conditions in which the ultimate vacuum was 5×10^{-5} Pa, the electrical power was 800 W in direct current, the Ar gas pressure was 6.0 Pa, the distance between the target and the substrate was 60 mm, and no substrate heating, to remove the processed layer of the target surface. Then the chamber was temporarily opened to air and the chamber members such as a deposition preventing plate were cleaned. Thereafter, vacuuming was carried out until the above-mentioned vacuum was achieved again. After the vacuuming, a presputtering process was carried out for 30 minutes to remove adsorbed atmospheric components and metal oxide layers, followed by the formation of a magnetic recording film having a thickness

- of 100 nm on a 4-inch Si wafer. Magnetic recording films having a thickness of 100 nm were formed on a total of 25 pieces of 4-inch Si wafer under the same conditions. With respect to the wafer after the film formation, the number of particles attached on the wafer surface and having a size of 1.0 μm or more was counted using a surface
- 5 inspection apparatus that was commercially available and the average value of the counts obtained from 25 wafers was calculated. The results are shown in Table 22.

[0100]

[Table 22]

Target	Composition of raw material powder (% by mass)						Composition of target (mol%)				Number of Cr oxide aggregates having absolute maximum length larger than 5 μm (aggregates/ mm^2)	Presence/absence of Cr oxide aggregates having absolute maximum length larger than 10 μm	Number of particles
	Alloy powder of Table 20	Pt powder	SiO ₂ powder	Cr powder	Co powder		Cr	Pt	SiO ₂	Co			
Present invention	9C	A: 24.4	42.9	3.7	-	Remainder	18.1	18.1	5.0	Remainder	393	Absent	66
	10C	B: 22.5				Remainder				Remainder	184	Absent	45
	11C	C: 20.8				Remainder				Remainder	340	Absent	57
	12C	D: 20.1				Remainder				Remainder	217	Absent	48
	13C	E: 19.4				Remainder				Remainder	329	Absent	58
	14C	F: 18.4				Remainder				Remainder	345	Absent	55
	15C	G: 17.8				Remainder				Remainder	425	Absent	75
	16C	H: 17.0				Remainder				Remainder	481	Absent	92
Comparative target	3C	I: 25.5	-	11.4	-	Remainder	-	-	-	Remainder	522*	Present	150
Conventional target 2C	4C	J: 16.5				Remainder				Remainder	537*	Present	173
	-	-	-	-	-	Remainder	-	-	-	Remainder	654*	Present	195

Symbols (*) indicate conditions outside the scope of the present invention.

[0101]

From the results shown in Table 22, it is apparent that the targets 9C to 16C of the present invention, in which the number of chromium oxide aggregates having an absolute maximum length of more than 5 μm in the microstructure was 500 aggregates/ mm^2 or less, generated less particles as compared to the conventional target 2C, in which the number of chromium oxide aggregates having an absolute maximum length of more than 5 μm in the microstructure was more than 500 aggregates/ mm^2 or the chromium oxide aggregates having an absolute maximum length of more than 10 μm were present.

[0102]

10 Example 19

The raw material powders prepared above were blended so as to give the compositions shown in Table 23 and the obtained blended powders were charged in a 10 L container together with a zirconia ball, which was a grinding medium. The atmosphere inside this container was replaced with an Ar gas atmosphere and thereafter, the container was sealed. This container was rotated for 16 hours using a ball mill to prepare mixed powders.

The obtained mixed powders were filled in a vacuum hot press apparatus and were subjected to a vacuum hot pressing process in a vacuum atmosphere under conditions in which the powders were retained at a temperature of 1,200°C and a pressure of 15 MPa for 3 hours to produce hot pressed bodies having the compositions shown in Table 23. These hot pressed bodies were cut to produce targets 17C to 24C of the present invention, comparative targets 5C and 6C, and a conventional target 3C having a dimension of 152.4 mm (diameter) and 3 mm (thickness).

[0103]

Absolute maximum lengths (maximum value of the distance between the two arbitrary points on the periphery of the particle) of the chromium oxide aggregates dispersed in the microstructure of the aforementioned targets 17C to 24C of the present invention, the comparative targets 5C and 6C, and the conventional target 3C were measured by an EPMA. The number of chromium oxide aggregates having an absolute maximum length of more than 5 μm and the presence/absence of coarse chromium oxide aggregates having an absolute maximum length of more than 10 μm are shown in Table 23. The method for measuring chromium oxide aggregates was the same as that employed in Example 17.

10 [0104]

Moreover, the aforementioned targets 17C to 24C of the present invention, the comparative targets 5C and 6C, and the conventional target 3C were degreased using an organic solvent and were subsequently subjected to vacuum drying by being retained under vacuum at 150°C for 8 hours. Thereafter, the targets were joined with a backing plate made of copper and were mounted on a commercially available sputtering apparatus. A presputtering process was carried out under the conditions in which the ultimate vacuum was 5×10^{-5} Pa, the electrical power was 800 W in direct current, the Ar gas pressure was 6.0 Pa, the distance between the target and the substrate was 60 mm, and no substrate heating was conducted, to remove the processed layer of the target surface. Then the chamber was temporarily opened to air and the chamber members such as a deposition preventing plate were cleaned. Thereafter, vacuuming was carried out until the above-mentioned vacuum was achieved again. After the vacuuming, a presputtering process was carried out for 30 minutes to remove adsorbed atmospheric components and metal oxide layers, followed by the formation of a magnetic recording

film having a thickness of 100 nm on a 4-inch Si wafer. Magnetic recording films having a thickness of 100 nm were formed on a total of 25 pieces of 4-inch Si wafer under the same conditions. With respect to the wafer after the film formation, the number of particles attached on the wafer surface and having a size of 1.0 μm or more was counted

5 using a surface inspection apparatus that was commercially available and the average value of the counts obtained from 25 wafers was calculated. The results are shown in Table 23.

[0105]

[Table 23]

Target	Composition of raw material powder (% by mass)					Composition of target (mol%)				Number of Cr oxide aggregates having absolute maximum length larger than 5 μm (aggregates/ mm^2)	Presence/absence of Cr oxide aggregates having absolute maximum length larger than 10 μm	Number of particles
	Alloy powder of Table 20	Pt powder	TiO ₂ powder	Cr powder	Co powder	Cr	Pt	TiO ₂	Co			
Present invention	17C	A: 19.3	33.9	9.2	Remainder	13.7	13.7	9.0	Remainder	372	Absent	63
	18C	B: 17.8			Remainder				Remainder	159	Absent	44
	19C	C: 16.5			Remainder				Remainder	201	Absent	46
	20C	D: 15.9			Remainder				Remainder	336	Absent	52
	21C	E: 15.3			Remainder				Remainder	305	Absent	55
	22C	F: 14.6			Remainder				Remainder	328	Absent	52
	23C	G: 14.1			Remainder				Remainder	412	Absent	72
	24C	H: 13.4			Remainder				Remainder	473	Absent	90
Comparative target	5C	I: 20.2			Remainder				Remainder	516*	Present	141
Conventional target 3C	6C	J: 13.0			Remainder				Remainder	541*	Present	149
	-	-			9.1				Remainder	650*	Present	186

Symbols (*) indicate conditions outside the scope of the present invention.

[0106]

From the results shown in Table 23, it is apparent that the aforementioned targets 17C to 24C of the present invention which were produced by blending the Co-Cr alloy powders A to H having a Cr content of 50 to 70 atomic% and a remainder containing Co
5 as the raw material powders generated less particles as compared to the conventional target 3C which was produced by blending and mixing a Co powder having a 50% particle size of 10 μm , a Cr powder having a 50% particle size of 10 μm , a Pt powder having a 50% particle size of 15 μm , and an TiO_2 powder having a 50% particle size of 3 μm without adding a Co-Cr alloy powder. However, it is apparent that the comparative
10 targets 5C and 6C which were produced using the Co-Cr alloy powders I and J having compositions that were outside the scope of the present invention generated numerous particles, and thus were not preferable.

[0107]

Example 20

15 The raw material powders prepared above were blended so as to give the compositions shown in Table 24 and the obtained blended powders were charged in a 10 L container together with a zirconia ball, which was a grinding medium. The atmosphere inside this container was replaced with an Ar gas atmosphere and thereafter, the container was sealed. This container was rotated for 16 hours using a ball mill to prepare
20 mixed powders.

The obtained mixed powders were filled in an SUS container and were subjected to a vacuum degassing treatment under conditions in which the powders were retained at a temperature of 550°C for 12 hours, and thereafter the mixed powders were vacuum encapsulated by sealing the SUS container. The SUS container filled with the mixed

powders was subjected to a hot isostatic pressing process under conditions in which the powders were retained at a temperature of 1,200°C and a pressure of 100 MPa for 3 hours followed by opening the SUS container to produce hot isostatic pressed bodies having the compositions shown in Table 24. These hot isostatic pressed bodies were cut
5 to produce targets 25C to 32C of the present invention, comparative targets 7C and 8C, and a conventional target 4C having a diameter of 152.4 mm and a thickness of 3 mm.

[0108]

Absolute maximum lengths (maximum value of the distance between the two arbitrary points on the periphery of the particle) of the chromium oxide aggregates
10 dispersed in the microstructure of the aforementioned targets 25C to 32C of the present invention, the comparative targets 7C and 8C, and the conventional target 4C were measured by an EPMA. The number of chromium oxide aggregates having an absolute maximum length of more than 5 μm and the presence/absence of coarse chromium oxide aggregates having an absolute maximum length of more than 10 μm are shown in Table
15 24. The method for measuring chromium oxide aggregates was the same as that employed in Example 17.

[0109]

Moreover, the aforementioned targets 25C to 32C of the present invention, the comparative targets 7C and 8C, and the conventional target 4C were degreased using an
20 organic solvent and were subsequently subjected to vacuum drying by being retained under vacuum at 150°C for 8 hours. Thereafter, the targets were joined with a backing plate made of copper and were mounted on a commercially available sputtering apparatus. A presputtering process was carried out under conditions in which the ultimate vacuum was 5×10^{-5} Pa, the electrical power was 800 W in direct current, the Ar

gas pressure was 6.0 Pa, the distance between the target and the substrate was 60 mm, and no substrate heating was conducted, to remove the processed layer of the target surface. Then the chamber was temporarily opened to air and the chamber members such as a deposition preventing plate were cleaned. Thereafter, vacuuming was carried out

5 until the above-mentioned vacuum was achieved again. After the vacuuming, a presputtering process was carried out for 30 minutes to remove adsorbed atmospheric components and metal oxide layers, followed by the formation of a magnetic recording film having a thickness of 100 nm on a 4-inch Si wafer. Magnetic recording films having a thickness of 100 nm were formed on a total of 25 pieces of 4-inch Si wafer under the

10 same conditions. With respect to the wafer after the film formation, the number of particles attached on the wafer surface and having a size of 1.0 μm or more was counted using a surface inspection apparatus that was commercially available and the average value of the counts obtained from 25 wafers was calculated. The results are shown in Table 24.

15 [0110]

[Table 24]

Target	Composition of raw material powder (% by mass)					Composition of target (mol%)				Number of Cr oxide aggregates having absolute maximum length larger than 5 μm (aggregates/ mm^2)	Presence/absence of Cr oxide aggregates having absolute maximum length larger than 10 μm	Number of particles
	Alloy powder of Table 20	Pt powder	Ta ₂ O ₅ powder	Cr powder	Co powder	Cr	Pt	Ta ₂ O ₅	Co			
Present invention	25C	A: 15.4			Remainder				Remainder	377	Absent	65
	26C	B: 14.2			Remainder				Remainder	160	Absent	46
	27C	C: 13.1			Remainder				Remainder	210	Absent	50
	28C	D: 12.7			Remainder				Remainder	329	Absent	55
	29C	E: 12.2			Remainder				Remainder	299	Absent	57
	30C	F: 11.6	34.8	18.3	-	13.4	17.3	4.0	Remainder	312	Absent	55
	31C	G: 11.2			Remainder				Remainder	415	Absent	75
	32C	H: 10.7			Remainder				Remainder	452	Absent	86
Comparative target	7C	I: 16.1			Remainder				Remainder	52.5*	Present	146
Conventional target 4C	8C	J: 10.4			Remainder				Remainder	539*	Present	147
		-		7.2	Remainder				Remainder	635*	Present	183

Symbols (*) indicate conditions outside the scope of the present invention.

[0111]

From the results shown in Table 24, it is apparent that the aforementioned targets 25C to 32C of the present invention which were produced by blending the Co-Cr alloy powders A to H having a Cr content of 50 to 70 atomic% and a remainder containing Co as the raw material powders generated less particles as compared to the conventional target 4C which was produced by blending and mixing a Co powder having a 50% particle size of 10 μm , a Cr powder having a 50% particle size of 10 μm , a Pt powder having a 50% particle size of 15 μm , and an Ta_2O_5 powder having a 50% particle size of 3 μm without adding a Co-Cr alloy powder. However, it is apparent that the comparative targets 7C and 8C which were produced using the Co-Cr alloy powders I and J having compositions that were outside the scope of the present invention generated numerous particles, and thus were not preferable.

CLAIMS

1. A method for manufacturing a Co-base sintered alloy sputtering target for formation of a magnetic recording film which is less likely to generate particles, the method comprising:

providing, as raw material powders, a Cr-Co alloy powder consisting of 50 to 70 atomic% of Cr and a remainder containing Co, a Pt powder, a non-magnetic oxide powder, and a Co powder;

blending and mixing the raw material powders together so as to give a chemical composition consisting of 2 to 15 mol% of a nonmagnetic oxide, 3 to 20 mol% of Cr, and 5 to 30 mol% of Pt and a remainder containing Co; and thereafter

subjecting the resulting mixed powder to a pressure sintering process.

2. The method for manufacturing a Co-base sintered alloy sputtering target for the formation of a magnetic recording film which is less likely to generate particles according to Claim 1,

wherein the non-magnetic oxide is any one of silicon dioxide, tantalum oxide, titanium oxide, aluminum oxide, magnesium oxide, thorium oxide, zirconium oxide, cerium oxide, and yttrium oxide.

3. The method for manufacturing a Co-base sintered alloy sputtering target for the formation of a magnetic recording film which is less likely to generate particles according to Claim 1,

wherein the pressure sintering process is a hot pressing process or a hot isostatic pressing process.

4. A Co-base sintered alloy sputtering target for formation of a magnetic recording film which is less likely to generate particles manufactured by any one of the methods of Claims 1, 2, and 3.

5. A method for manufacturing a Co-base sintered alloy sputtering target for formation of a magnetic recording film which is less likely to generate particles, the method comprising:

providing, as raw material powders, a Cr-Pt binary alloy powder consisting of 10 to 90 atomic% of Pt and a remainder containing Cr, a Pt powder, a non-magnetic oxide powder, and a Co powder;

blending and mixing the raw material powders so as to give a chemical composition consisting of 2 to 15 mol% of the non-magnetic oxide, 3 to 20 mol% of Cr, and 5 to 30 mol% of Pt and a remainder containing Co; and thereafter

subjecting the resulting mixed powder to a pressure sintering process.

6. A method for manufacturing a Co-base sintered alloy sputtering target for formation of a magnetic recording film which is less likely to generate particles, the method comprising:

providing, as raw material powders, a Cr-Pt binary alloy powder consisting of 10 to 90 atomic% of Pt and a remainder containing Cr, a Co-Cr binary alloy powder

consisting of 50 to 70 atomic% of Cr and a remainder containing Co, a Pt powder, a non-magnetic oxide powder, and a Co powder;

blending and mixing the raw material powders so as to give a chemical composition consisting of 2 to 15 mol% of the non-magnetic oxide, 3 to 20 mol% of Cr, and 5 to 30 mol% of Pt and a remainder containing Co; and thereafter

subjecting the resulting mixed powder to a pressure sintering process.

7. A method for manufacturing a Co-base sintered alloy sputtering target for formation of a magnetic recording film which is less likely to generate particles, the method comprising:

providing, as raw material powders, a Cr-Pt binary alloy powder consisting of 10 to 90 atomic% of Pt and a remainder containing Cr, a Co-Cr binary alloy powder consisting of 50 to 70 atomic% of Cr and a remainder containing Co, a non-magnetic oxide powder, and a Co powder;

blending and mixing the raw material powders so as to give a chemical composition formed of 2 to 15 mol% of the non-magnetic oxide, 3 to 20 mol% of Cr, 5 to 30 mol% of Pt and a remainder containing Co; and thereafter

subjecting the resulting mixed powder to a pressure sintering process.

8. The method for manufacturing a Co-base sintered alloy sputtering target for the formation of a magnetic recording film which is less likely to generate particles according to any one of Claims 5, 6, and 7,

wherein the non-magnetic oxide is any one of silicon dioxide, tantalum oxide, titanium oxide, aluminum oxide, magnesium oxide, thorium oxide, zirconium oxide, cerium oxide, and yttrium oxide.

9. The method for manufacturing a Co-base sintered alloy sputtering target for the formation of a magnetic recording film which is less likely to generate particles according to any one of Claims 5, 6, and 7,

wherein the pressure sintering process is a hot pressing process or a hot isostatic pressing process.

10. A Co-base sintered alloy sputtering target for formation of a magnetic recording film which is less likely to generate particles manufactured by any one of the methods of Claims 5, 6, 7, 8, and 9 which is a Co-base sintered alloy sputtering target for the formation of a magnetic recording film having a chemical composition consisting of 2 to 15 mol% of the non-magnetic oxide, 3 to 20 mol% of Cr, and 5 to 30 mol% of Pt and a remainder containing Co,

wherein an absolute maximum length of chromium oxide aggregates dispersed in a microstructure is not more than 10 μm .

11. The Co-base sintered alloy sputtering target for the formation of a magnetic recording film which is less likely to generate particles according to Claim 10,

wherein the non-magnetic oxide is any one of silicon dioxide, tantalum oxide, titanium oxide, aluminum oxide, magnesium oxide, thorium oxide, zirconium oxide, cerium oxide, and yttrium oxide.

12. A Co-base sintered alloy sputtering target for formation of a magnetic recording film which is less likely to generate particles having a composition consisting of 2 to 15 mol% of a non-magnetic oxide, 3 to 20 mol% of Cr, and 5 to 30 mol% of Pt and a remainder containing Co and inevitable impurities,

wherein the number of chromium oxide aggregates having an absolute maximum length of more than 5 μm in a microstructure is not more than 500 aggregates/ mm^2 .

13. The Co-base sintered alloy sputtering target for the formation of a magnetic recording film which is less likely to generate particles according to Claim 12,

wherein chromium oxide aggregates having an absolute maximum length of more than 10 μm are absent in a target microstructure.