Claims

1. A ferromagnetic material sintered sputtering target containing nonmagnetic oxides comprising: having an oxide structure in which the oxides have an average grain diameter of 400 nm or less and an aspect ratio of 2 or less for a rectangular circumscribing an oxide grain to have an area thereof at the minimum.

2. The ferromagnetic material sintered sputtering target containing nonmagnetic oxides according to claim 1 comprising, Phase A having an oxide structure in which an average grain diameter is 400 nm or less and Phase B in which the oxides surrounding Phase A have an average grain diameter of 2 μm or less.

3. The ferromagnetic material sintered sputtering target according to claim 1 or 2, wherein Cr is 45 mol% or less (except 0 mol%) and Co.

4. The ferromagnetic material sintered sputtering target according to any one of claims 1 to 3, wherein Cr is 45 mol% or less (except 0 mol%), Pt is 1 mol% or more and 30 mol% or less, and Co.

5. The ferromagnetic material sintered sputtering target according to any one of claims 1 to 4, wherein Pt is 1 mol% or more and 30 mol% or less and Co.

6. The ferromagnetic material sintered sputtering target according to any one of claims 1 to 5, wherein Pt is 5 mol% or more and 60 mol% or less and Fe.

7. The ferromagnetic material sintered sputtering target according to any one of claims 1 to 6, wherein as an additive element, one or more elements selected from B, Ti, V, Mn, Zr, Nb, Ru, Mo, Ta, W, Ag, Au, Cu and C in an amount of 0.5 mol% or more and 20 mol% or less is added.

8. The ferromagnetic material sintered sputtering target according to any one of claims 1 to 7, wherein as an oxide raw material, an oxide of one or more components selected from B, Si, Cr, Ti, Ta, W, Al, Mg, Mn, Ca, Zr, and Y in an amount of 1 to 20 mol% is added.

9. The ferromagnetic material sintered sputtering target according to any one of claims 1 to 8, wherein as an additive material, an inorganic substance material having one or more components selected from carbon, nitride and carbide is added.

10. A ferromagnetic material sintered sputtering target containing nonmagnetic oxides comprising: having Phase A in which the oxides have an average grain diameter of 400 nm or less, and Phase B in which the oxides surrounding Phase A have an average grain diameter of 2 μm or less.

11. The ferromagnetic material sintered sputtering target according to claim 10,

having an oxide structure in which an aspect ratio is 2 or less for a rectangular circumscribing an oxide grain to have an area thereof at the minimum.

12. The ferromagnetic material sintered sputtering target containing nonmagnetic oxides according to claim 10 or 11 comprising, Phase A having an oxide structure in which an average grain diameter is 400 nm or less and Phase B in which the oxides surrounding Phase A have an average grain diameter of 2 μm or less.

13. The ferromagnetic material sintered sputtering target according to any one of claims 10 to 12, wherein Cr is 45 mol% or less (except 0 mol%) and Co.

14. The ferromagnetic material sintered sputtering target according to any one of claims 10 to 13, wherein Cr is 45 mol% or less (except 0 mol%), Pt is 1 mol% or more and 30 mol% or less, and Co.

15. The ferromagnetic material sintered sputtering target according to any one of claims 10 to 14, wherein Pt is 1 mol% or more and 30 mol% or less and Co.

16. The ferromagnetic material sintered sputtering target according to any one of claims 10 to 15, wherein Pt is 5 mol% or more and 60 mol% or less and Fe.

17. The ferromagnetic material sintered sputtering target according to any one of claims 10 to 16, wherein as an additive element, one or more elements selected from B, Ti, V, Mn, Zr, Nb, Ru, Mo, Ta, W, Ag, Au, Cu and C in an amount of 0.5 mol% or more and 20 mol% or less is added.

18. The ferromagnetic material sintered sputtering target according to any one of claims 10 to 17, wherein as an oxide raw material, an oxide of one or more components selected from B, Si, Cr, Ti, Ta, W, Al, Mg, Mn, Ca, Zr, and Y in an amount of 1 to 20 mol% is added.

19. The ferromagnetic material sintered sputtering target according to any one of claims 10 to 18, wherein as an additive material, an inorganic substance material having one or more components selected from carbon, nitride and carbide is added.

20. A method of producing a ferromagnetic material sintered sputtering target containing nonmagnetic oxides, the method comprising: depositing an oxide-containing ferromagnetic material on a substrate using a ferromagnetic material and an oxide material by PVD or CVD, removing the substrate from the deposited ferromagnetic material, pulverizing the material to obtain a material for the target, and further sintering the material.

21. A method of producing an oxide-containing ferromagnetic material sintered sputtering target according to any one of claims 1 to ~~10~~9, by depositing an oxide-containing ferromagnetic material on a substrate using a ferromagnetic

material and an oxide material by PVD or CVD, removing the substrate from the deposited ferromagnetic material, pulverizing the material to obtain a material for the target, and further sintering the material.

22. A method of producing an oxide-containing ferromagnetic material sintered sputtering target according to any one of claims 10 to 19, by depositing an oxide-containing ferromagnetic material on a substrate using a ferromagnetic material and an oxide material by PVD or CVD, removing the substrate from the deposited ferromagnetic material, pulverizing the material to obtain a material for the target, and further sintering the material.

23. A method of producing a ferromagnetic material sintered sputtering target containing nonmagnetic oxides, by depositing an oxide-containing ferromagnetic material on a substrate using a ferromagnetic material and an oxide material by PVD or CVD, removing the substrate from the deposited ferromagnetic material, pulverizing the material to obtain a material for the target, further mixing the material with added insufficient components, and sintering the mixture.

24. A method of producing the oxide-containing ferromagnetic material sintered sputtering target according to any one of claims 1 to ~~10~~9, by depositing a ferromagnetic material on a substrate by PVD or CVD, removing the substrate from the deposited ferromagnetic material, pulverizing the material to obtain a material for the target, further mixing the material with added insufficient components, and sintering the mixture.

25. A method of producing the oxide-containing ferromagnetic material sintered sputtering target according to any one of claims 10 to 19, by depositing a ferromagnetic material on a substrate by PVD or CVD, removing the substrate from the deposited ferromagnetic material, pulverizing the material to obtain a material for the target, further mixing the material with added insufficient components, and sintering the mixture.

26. A method of producing a ferromagnetic material sintered sputtering target containing nonmagnetic oxides, by depositing an oxide-containing ferromagnetic material on a substrate using a ferromagnetic material and an oxide material by PVD or CVD, removing the substrate from the deposited ferromagnetic material, and further performing hot isostatic pressing (HIP) on the resulting ferromagnetic material.

27. A method of producing the oxide-containing ferromagnetic material sintered sputtering target according to any one of claims 1 to ~~10~~9, by depositing a ferromagnetic material on a substrate by PVD or CVD, removing the substrate from the deposited ferromagnetic material, and further performing hot isotactic

pressing (HIP) on the resulting ferromagnetic material.

28. A method of producing the oxide-containing ferromagnetic material sintered sputtering target according to any one of claims 10 to 19, by depositing a ferromagnetic material on a substrate by PVD or CVD, removing the substrate from the deposited ferromagnetic material, and further performing hot isotactic pressing (HIP) on the resulting ferromagnetic material.

29. A method of producing a ferromagnetic material sintered sputtering target containing nonmagnetic oxides, by depositing an oxide-containing ferromagnetic material on a substrate using a ferromagnetic material and an oxide material by PVD or CVD, removing the substrate from the deposited ferromagnetic material and further sintering the material to obtain a target.

30. A method of producing the oxide-containing ferromagnetic material sintered sputtering target according to any one of claims 1 to ~~10~~9, by depositing an oxide-containing ferromagnetic material on a substrate using a ferromagnetic material and an oxide material by PVD or CVD, removing the substrate from the deposited ferromagnetic material and further sintering the material to obtain a target.

31. A method of producing the oxide-containing ferromagnetic material sintered sputtering target according to any one of claims 10 to 19, by depositing an oxide-containing ferromagnetic material on a substrate using a ferromagnetic material and an oxide material by PVD or CVD, removing the substrate from the deposited ferromagnetic material and further sintering the material to obtain a target.

32. The method of producing the oxide-containing ferromagnetic material sintered sputtering target according to claim 26 or 29, by removing the substrate from the deposited ferromagnetic material, and laminating the obtained thin film to obtain a target.

~~32~~33. The method of producing the oxide-containing ferromagnetic material sintered sputtering target according to claim 27, by removing the substrate from the deposited ferromagnetic material, and laminating the obtained thin film to obtain a target.

~~33~~34. The method of producing the oxide-containing ferromagnetic material sintered sputtering target according to claim 28, by removing the substrate from the deposited ferromagnetic material, and laminating the obtained thin film to obtain a target.

~~34~~35. The method of producing the oxide-containing ferromagnetic material sintered sputtering target according to claim 30, by removing the substrate from

the deposited ferromagnetic material, and laminating the obtained thin film to obtain a target.

~~35~~36. The method of producing the oxide-containing ferromagnetic material sintered sputtering target according to claim 31, by removing the substrate from the deposited ferromagnetic material, and laminating the obtained thin film to obtain a target.