Zn content in the upper granular layer is 3 at% or mor, the thickness of the cap layer in which the d(−Hn)/dtc is positive is considerably thinner, so that the addition of Zn further improves SFD in the thin cap layer.

Description of Reference Numerals

[0001]

1 recording layer

2 granular layer

2a boundary portion

2b remaining portion

3 cap layer

4a metal phase

4b oxide phase

Tg total thickness of the entire granular layer

Tb thickness of boundary portion

~~Tk~~ Tc thickness of cap layer

CLAIMS

1. A perpendicular magnetic recording medium, comprising: a granular layer containing a metal oxide as a non-magnetic material, the granular layer having the magnetic material dispersed in the non-magnetic material; and a cap layer formed on the granular layer, the cap layer containing no metal oxide, as layers forming at least a part of a recording layer,

wherein at least one metal layer of the granular layer comprises Co,

wherein at least one oxide phase of the granular layer immediately below the cap layer at a boundary portion with the cap layer comprises at least one selected from the group consisting of Zn, W, Mn, Fe and Mo, and

wherein the oxide phase of the granular layer at the boundary portion comprises Zn, and the oxide phase has a Zn content of 3 at% or more.

2. The perpendicular magnetic recording medium according to claim 1, wherein the oxide phase of the granular layer at the boundary portion further comprises at least one of B and Si.

3. The perpendicular magnetic recording medium according to claim 1 or 2, wherein the oxide phase of the granular layer at the boundary portion further comprises Ti.

4. The perpendicular magnetic recording medium according to any one of claims 1 to 3, wherein the perpendicular magnetic recording medium has a Zn-free layer in a remaining portion of the granular layer, the remaining portion excluding the boundary portion.

5. The perpendicular magnetic recording medium according to claim 4, wherein the remaining portion of the granular layer comprises an oxide of at least one element selected from the group consisting of Si, B and Ti as the oxide phase, and the oxide phase in the remaining portion has a total oxide content of from 20 vol.% to 50 vol.%.

~~6. The perpendicular magnetic recording medium according to any one of claims 1 to 5, wherein the oxide phase of the granular layer at the boundary portion comprises Zn, and the oxide phase has a Zn content of 3 at% or more.~~

~~7~~6. The perpendicular magnetic recording medium according to any one of claims 1 to ~~6~~5, wherein the perpendicular magnetic recording medium has a ratio of a thickness of the boundary portion to a total thickness of the entire granular layer of from 3% to 50% in a lamination direction of the recording layer.

~~8~~7. The perpendicular magnetic recording medium according to any one of claims 1 to ~~7~~6, wherein the entire granular layer including the boundary portion comprises at least one metal selected from the group consisting of Co, Pt, Ru and Cr, as at least one metal layer.

~~8~~9. The perpendicular magnetic recording medium according to any one of claims 1 to ~~8~~7, wherein the cap layer comprises at least one metal selected from the group consisting of Co, Cr, Pt and B.

~~10~~9. The perpendicular magnetic recording medium according to any one of claims 1 to ~~9~~8, wherein the cap layer has a thickness of from 1 nm to 3 nm in the lamination direction of the recording layer.