[0028]

All atoms in the magnetic crystal grains may not necessarily have an ordered structure. Rather, it is necessary that a degree of order S indicating the degree of an ordered structure is not less than a predetermined value. The degree of order S is determined by the ratio of a measured value obtained by X-ray diffractometry (XRD) of a magnetic recording medium and a theoretical value in the case where the magnetic crystal grains are completely ordered. In the case of a $L1\text{~~0~~}_0$ type ordered alloy, the degree of order S is calculated with an integrated intensity of (001) and (002) peaks derived from the ordered alloy. The degree of order S can be obtained as a square root of a quotient of ~~by dividing~~ a ratio of the measured integrated intensity of the (~~002~~001) peak to that of the (~~001~~002) peak~~,~~ divided by a theoretically calculated ratio of the integrated intensity of the (~~002~~001) peak to that of the (~~001~~002) peak in the case where the ordered alloy is completely ordered. If thus obtained degree of order S is not less than 0.5, the magnetic crystal grains have a magnetic anisotropy constant Ku practical for the magnetic recording medium.

method, or the like, for example.

[0026]

The first magnetic recording layer 50 comprises one or more magnetic layers. Hereinafter, the magnetic layer in contact with the first seed layer 40 is referred to as a first magnetic layer. The first magnetic layer comprises Fe, Pt and Ti. The first magnetic layer has a granular structure consisting of: magnetic crystal grains comprising an $L1_0$ type ordered alloy comprising Fe and Pt; and a non-magnetic grain boundary comprising Ti.

[0027]

The $L1_0$ type ordered alloy from which the magnetic crystal grains are composed may further comprise at least one element selected from the group consisting of Ni, Mn, Ag, Au and Cr, for the purpose of modification of properties of the magnetic crystal grains. Desirable modification of properties includes lowering the temperature required for ordering of the $L1_0$ type ordered alloy.

[0028]

All atoms in the magnetic crystal grains may not necessarily have an ordered structure. Rather, it is necessary that a degree of order S indicating the degree of an ordered structure is not less than a predetermined value. The degree of order S is determined by the ratio of a measured value obtained by X-ray diffractometry (XRD) of a magnetic recording medium and a theoretical value in the case where the magnetic crystal grains are completely ordered. In the case of a L10 type ordered alloy, the degree of order S is calculated with an integrated intensity of (001) and (002) peaks derived from the ordered alloy. The degree of order S can be obtained by dividing a ratio of the measured integrated intensity of the (002) peak to that of the (001) peak, by a theoretically calculated ratio of the integrated intensity of the (002) peak to that of the (001) peak in the case where the ordered alloy is completely ordered. If thus obtained degree of order S is not less than 0.5, the magnetic crystal grains have a magnetic

anisotropy constant Ku practical for the magnetic recording medium.

[0029]

The non-magnetic grain boundary comprises Ti, and preferably consists of Ti. The first magnetic layer comprises 4 at% or more and 12 at% or less, preferably 5 at% or more and 10 at% or less of Ti, based on the total number of atoms in the layer. The term "at%" means a percentage by atoms in the present specification. By comprising Ti in an amount within the above-described range, it become possible to promote separation between the magnetic crystal grains and the non-magnetic grain boundary, and to significantly increase the coercive force Hc of the magnetic layer.

[0030]

In another embodiment of the first magnetic recording layer 50, a second magnetic layer is further disposed in addition to the above-described first magnetic layer. It becomes possible to further improve the performance of the magnetic recording medium, by disposing the second magnetic layer.

[0031]

One of constitution examples is a constitution in which a second magnetic layer is further disposed, the second magnetic layer having a Curie temperature Tc different from that of the first magnetic layer and a purpose of controlling Tc. Hereinafter, such second magnetic layer is referred to as "Tc control magnetic layer". The magnetic switching field of the entire magnetic recording medium, which is required at the time of recording, can be reduced by setting the recording temperature in accordance with the Tc's of both of the magnetic layers. For example, the Curie temperature of the Tc control magnetic layer is set below that of the first magnetic layer. Then, if the recording temperature is set between the Curie temperatures of both of the magnetic layers, the magnetic field required to reverse a record is reduced, due to disappearance of the magnetization of the Tc control magnetic layer at the

method, or the like, for example.

[0026]

The first magnetic recording layer 50 comprises one or more magnetic layers. Hereinafter, the magnetic layer in contact with the first seed layer 40 is referred to as a first magnetic layer. The first magnetic layer comprises Fe, Pt and Ti. The first magnetic layer has a granular structure consisting of: magnetic crystal grains comprising an $L1_0$ type ordered alloy comprising Fe and Pt; and a non-magnetic grain boundary comprising Ti.

[0027]

The $L1_0$ type ordered alloy from which the magnetic crystal grains are composed may further comprise at least one element selected from the group consisting of Ni, Mn, Ag, Au and Cr, for the purpose of modification of properties of the magnetic crystal grains. Desirable modification of properties includes lowering the temperature required for ordering of the $L1_0$ type ordered alloy.

[0028]

All atoms in the magnetic crystal grains may not necessarily have an ordered structure. Rather, it is necessary that a degree of order S indicating the degree of an ordered structure is not less than a predetermined value. The degree of order S is determined by the ratio of a measured value obtained by X-ray diffractometry (XRD) of a magnetic recording medium and a theoretical value in the case where the magnetic crystal grains are completely ordered. In the case of a $L1_0$ type ordered alloy, the degree of order S is calculated with an integrated intensity of (001) and (002) peaks derived from the ordered alloy. The degree of order S can be obtained as a square root of a quotient of a ratio of the measured integrated intensity of the (001) peak to that of the (002) peak, divided by a theoretically calculated ratio of the integrated intensity of the (001) peak to that of the (002) peak in the case where the ordered alloy is completely ordered. If thus obtained degree of order S is not less than 0.5, the magnetic crystal

grains have a magnetic anisotropy constant Ku practical for the magnetic recording medium.

[0029]

The non-magnetic grain boundary comprises Ti, and preferably consists of Ti. The first magnetic layer comprises 4 at% or more and 12 at% or less, preferably 5 at% or more and 10 at% or less of Ti, based on the total number of atoms in the layer. The term "at%" means a percentage by atoms in the present specification. By comprising Ti in an amount within the above-described range, it become possible to promote separation between the magnetic crystal grains and the non-magnetic grain boundary, and to significantly increase the coercive force Hc of the magnetic layer.

[0030]

In another embodiment of the first magnetic recording layer 50, a second magnetic layer is further disposed in addition to the above-described first magnetic layer. It becomes possible to further improve the performance of the magnetic recording medium, by disposing the second magnetic layer.

[0031]

One of constitution examples is a constitution in which a second magnetic layer is further disposed, the second magnetic layer having a Curie temperature Tc different from that of the first magnetic layer and a purpose of controlling Tc. Hereinafter, such second magnetic layer is referred to as "Tc control magnetic layer". The magnetic switching field of the entire magnetic recording medium, which is required at the time of recording, can be reduced by setting the recording temperature in accordance with the Tc's of both of the magnetic layers. For example, the Curie temperature of the Tc control magnetic layer is set below that of the first magnetic layer. Then, if the recording temperature is set between the Curie temperatures of both of the magnetic layers, the magnetic field required to reverse a record is reduced, due to disappearance of the magnetization of the Tc control magnetic layer at the