[0003] PTL 1: Japanese Unexamined Patent Publication (KOKAI) No. 2010-64921

Summary

[0003a] In one aspect of the present disclosure, there is provided a glass for magnetic recording medium substrate,

which is an amorphous oxide glass,

wherein, in terms of mol%:

an SiO_2 content ranges from 45 to 68%;

an Al_2O_3 content ranges from 5 to 20%;

a total content of SiO_2 and Al_2O_3 ($SiO_2 + Al_2O_3$) ranges from 60 to 80%;

a B_2O_3 content ranges from 0 to 5%;

an MgO content ranges from 3 to 28%;

a CaO content ranges from 0 to 18%;

a total content of BaO and SrO (BaO + SrO) ranges from 0 to 2%;

a total content of alkali earth metal oxides (MgO + CaO + SrO + BaO) ranges from 12 to 30%;

a total content of alkali metal oxides ($Li_2O + Na_2O + K_2O$) ranges from 3.5 to 15%;

at least one kind selected from the group consisting of Sn oxide and Ce oxide being included, a total content of Sn oxide and Ce oxide ranges from 0.05 to 2.00%,

a content of Li_2O is equal to or less than 8%;

a molar ratio of Li_2O content relative to the total content of Li_2O, Na_2O and K_2O (Li_2O/ (Li_2O + Na_2O + K_2O)) ranges from 0.4 to 1;

a content of TiO_2 ranges from 0 to 5%;

a total content of HfO_2, Nb_2O_5, Ta_2O_5, La_2O_3 and Y_2O_3 (HfO_2 + Nb_2O_5 + Ta_2O_5 + La_2O_3 + Y_2O_3) ranges from 0 to 5%; and

a content of ZrO_2 ranges from 0 to 3%,

a glass transition temperature is equal to or higher than 625°C;

a Young's modulus is equal to or more than 83 GPa;

a specific gravity is equal to or less than 2.85; and

an average linear expansion coefficient at 100 to 300°C is equal to or more than 48×10^{-7}/°C.

[0003b] In another aspect of the present disclosure, there is provided a magnetic recording medium substrate, which is comprised of the glass for magnetic recording medium substrate as disclosed herein.

[0003c] In a further aspect of the present disclosure, there is provided a magnetic recording medium, which comprises a magnetic recording layer on the magnetic recording medium substrate as disclosed herein.

[0003d] In a further aspect of the present disclosure, there is also provided a glass spacer for magnetic recording and reproducing apparatus,

which is an amorphous oxide glass,

wherein, in terms of mol%:

an SiO_2 content ranges from 45 to 68%;

an Al_2O_3 content ranges from 5 to 20%;

a total content of SiO_2 and Al_2O_3 ($SiO_2 + Al_2O_3$) ranges from 60 to 80%;

a B_2O_3 content ranges from 0 to 5%;

an MgO content ranges from 3 to 28%;

a CaO content ranges from 0 to 18%;

a total content of BaO and SrO (BaO + SrO) ranges from 0 to 2%;

a total content of alkali earth metal oxides (MgO + CaO + SrO + BaO) ranges from 12 to 30%;

a total content of alkali metal oxides ($Li_2O + Na_2O + K_2O$) ranges from 3.5 to 15%;

at least one kind selected from the group consisting of Sn oxide and Ce oxide being included, a total content of Sn oxide and Ce oxide ranges from 0.05 to 2.00%,

a content of Li_2O is equal to or less than 8%;

a molar ratio of Li_2O content relative to the total content of Li_2O, Na_2O and K_2O (Li_2O/ (Li_2O + Na_2O + K_2O)) ranges from 0.4 to 1;

a content of TiO_2 ranges from 0 to 5%;

a total content of HfO_2, Nb_2O_5, Ta_2O_5, La_2O_3 and Y_2O_3 (HfO_2 + Nb_2O_5 + Ta_2O_5 + La_2O_3 + Y_2O_3) ranges from 0 to 5%; and

a content of ZrO_2 ranges from 0 to 3%,

a glass transition temperature is equal to or higher than 625°C;

a Young's modulus is equal to or more than 83 GPa;

a specific gravity is equal to or less than 2.85; and

an average linear expansion coefficient at 100 to 300°C is equal to or more than 48×10^{-7}/°C.

[0003d] In a further aspect of the present disclosure, there is also provided a glass spacer for a magnetic recording and reproducing apparatus, which comprises at least one of:

the magnetic recording medium disclosed herein; and

the glass spacer for magnetic recording and reproducing apparatus disclosed herein.

Technical Problem

[0004] In a process of forming a magnetic recording layer on a magnetic recording medium substrate, film formation at a high temperature is usually performed or a heat treatment at a high temperature is performed after film formation. Accordingly, a glass for magnetic

recording medium substrate is required to have high heat resistance capable of withstanding a high temperature treatment, specifically to have a high glass transition temperature.

[0005] On the other hand, a magnetic recording and reproducing apparatus incorporated with a magnetic recording medium (generally referred to as a HDD (hard disk drive)) has a structure in which the center portion is pressed down with a spindle of a spindle motor and a clamp and the magnetic recording medium itself is rotated. As a consequence, when there is a large difference between respective thermal expansion coefficients of a magnetic recording medium substrate and a spindle material constituting the spindle portion, deviation occurs during use between thermal expansion/ thermal contraction of the spindle and thermal expansion/ thermal contraction of the magnetic recording medium substrate relative to ambient temperature change. As a result, a phenomenon such as deformation of the magnetic recording medium is generated. When the phenomenon is generated, a head cannot read written information to cause deterioration of reliability on recording/ reproduction.

CLAIMS

1. A glass for magnetic recording medium substrate,

which is an amorphous oxide glass,

wherein, in terms of mol%:

an SiO_2 content ranges from 45 to 68%;

an Al_2O_3 content ranges from 5 to 20%;

a total content of SiO_2 and Al_2O_3 ($SiO_2 + Al_2O_3$) ranges from 60 to 80%;

a B_2O_3 content ranges from 0 to 5%;

an MgO content ranges from 3 to 28%;

a CaO content ranges from 0 to 18%;

a total content of BaO and SrO (BaO + SrO) ranges from 0 to 2%;

a total content of alkali earth metal oxides (MgO + CaO + SrO + BaO) ranges from 12 to 30%;

a total content of alkali metal oxides ($Li_2O + Na_2O + K_2O$) ranges from 3.5 to 15%;

at least one kind selected from the group consisting of Sn oxide and Ce oxide being included, a total content of Sn oxide and Ce oxide ranges from 0.05 to 2.00%,

a content of Li_2O is equal to or less than 8%;

a molar ratio of Li_2O content relative to the total content of Li_2O, Na_2O and K_2O ($Li_2O/ (Li_2O + Na_2O + K_2O)$) ranges from 0.4 to 1;

a content of TiO_2 ranges from 0 to 5%;

a total content of HfO_2, Nb_2O_5, Ta_2O_5, La_2O_3 and Y_2O_3 ($HfO_2 + Nb_2O_5 + Ta_2O_5 + La_2O_3 + Y_2O_3$) ranges from 0 to 5%; and

a content of ZrO_2 ranges from 0 to 3%,

a glass transition temperature is equal to or higher than 625°C;

a Young's modulus is equal to or more than 83 GPa;

a specific gravity is equal to or less than 2.85; and

an average linear expansion coefficient at 100 to 300°C is equal to or more than 48×10^{-7}/°C.

2. The glass for magnetic recording medium substrate according to claim 1,

wherein

a content of Na_2O ranges from 0 to 10 mol%; and

a content of K_2O ranges from 0 to 5 mol%.

3. The glass for magnetic recording medium substrate according to claim 1 or 2,

which comprises Sn oxide and Ce oxide.

4. The glass for magnetic recording medium substrate according to any of claims 1 to 3,

wherein a molar ratio of a total content of MgO and CaO relative to a total content of alkali earth metal oxides {(MgO + CaO)/(MgO + CaO + SrO + BaO)} ranges from 0.75 to 1.00.

5. A magnetic recording medium substrate, which is comprised of the glass for magnetic recording medium substrate according to any of claims 1 to 4.

6. A magnetic recording medium, which comprises a magnetic recording layer on the magnetic recording medium substrate according to claim 5.

7. A glass spacer for magnetic recording and reproducing apparatus,

which is an amorphous oxide glass,

wherein, in terms of mol%:

an SiO_2 content ranges from 45 to 68%;

an Al_2O_3 content ranges from 5 to 20%;

a total content of SiO_2 and Al_2O_3 ($SiO_2 + Al_2O_3$) ranges from 60 to 80%;

a B_2O_3 content ranges from 0 to 5%;

an MgO content ranges from 3 to 28%;

a CaO content ranges from 0 to 18%;

a total content of BaO and SrO (BaO + SrO) ranges from 0 to 2%;

a total content of alkali earth metal oxides (MgO + CaO + SrO + BaO) ranges from 12 to 30%;

a total content of alkali metal oxides ($Li_2O + Na_2O + K_2O$) ranges from 3.5 to 15%;

at least one kind selected from the group consisting of Sn oxide and Ce oxide being included, a total content of Sn oxide and Ce oxide ranges from 0.05 to 2.00%,

a content of Li_2O is equal to or less than 8%;

a molar ratio of Li_2O content relative to the total content of Li_2O, Na_2O and K_2O (Li_2O/ (Li_2O + Na_2O + K_2O)) ranges from 0.4 to 1;

a content of TiO_2 ranges from 0 to 5%;

a total content of HfO_2, Nb_2O_5, Ta_2O_5, La_2O_3 and Y_2O_3 (HfO_2 + Nb_2O_5 + Ta_2O_5 + La_2O_3 + Y_2O_3) ranges from 0 to 5%; and

a content of ZrO_2 ranges from 0 to 3%,

a glass transition temperature is equal to or higher than 625°C;

a Young's modulus is equal to or more than 83 GPa;

a specific gravity is equal to or less than 2.85; and

an average linear expansion coefficient at 100 to 300°C is equal to or more than 48×10^{-7}/°C.

8. A magnetic recording and reproducing apparatus, which comprises at least one of:

the magnetic recording medium according to claim 6; and

the glass spacer for magnetic recording and reproducing apparatus according to claim 7.

GLASS FOR MAGNETIC RECORDING MEDIUM SUBSTRATE, MAGNETIC RECORDING MEDIUM SUBSTRATE, MAGNETIC RECORDING MEDIUM AND GLASS SPACER FOR MAGNETIC RECORDING AND REPRODUCING APPARATUS

ABSTRACT

Provided is a glass for magnetic recording medium substrate, which is an amorphous oxide glass, wherein, in terms of mol%, an SiO_2 content ranges from 45 to 68%; an Al_2O_3 content ranges from 5 to 20%; a total content of SiO_2 and Al_2O_3 ranges from 60 to 80%; a B_2O_3 content ranges from 0 to 5%; an MgO content ranges from 3 to 28%; a CaO content ranges from 0 to 18%; a total content of BaO and SrO ranges from 0 to 2%; a total content of alkali earth metal oxides ranges from 12 to 30%; a total content of alkali metal oxides ranges from 3.5 to 15%; and at least one kind selected from the group consisting of Sn oxide and Ce oxide being included, a total content of Sn oxide and Ce oxide ranges from 0.05 to 2.00%, a glass transition temperature is equal to or higher than 625°C; a Young's modulus is equal to or more than 83 GPa; a specific gravity is equal to or less than 2.85; and an average linear expansion coefficient at 100 to 300°C is equal to or more than 48×10^{-7}/°C.

[No Available Figure]