magnetic disks without using a fluorine solvent.

Solution to Problem

[0008]

The inventor of the present invention studied diligently to solve the above-described object, and eventually found that a perfluoropolyether compound having a number average molecular weight and including hydroxyl groups, the number average molecular weight and the number of the hydroxyl groups satisfying a particular expression, is soluble in water and that a lubricant solution obtained by dissolving the compound in water exhibits the same functionality as conventional lubricant solutions, and thereby complete the present invention. Specifically, the present invention includes the following configurations:

<1> A lubricant solution including: water; and a perfluoropolyether compound that satisfies Expression (I) below:

$$N_{OH} / (Mn/1500) \geq 2 \cdots (I),$$

where N_{OH} represents the number of hydroxyl groups contained per molecule of the perfluoropolyether compound and Mn represents a number average molecular weight of the perfluoropolyether compound.

~~<1> A lubricant solution including: water; and a perfluoropolyether compound that satisfies Expression (I) below:~~

~~$N_{OH} / (Mn/1500) \geq 2 \cdots (I)$,~~

~~where N_{OH} represents the number of hydroxyl groups contained per molecule of the perfluoropolyether compound and Mn represents a number average molecular weight of the perfluoropolyether compound.~~

<2> The lubricant solution according to <1>, wherein the perfluoropolyether compound has a structure of Formula (1) below:

$$-(CF_2)_x(CF(CF_3))_yO(CF_2O)_z(CF_2CF_2O)_l(CF_2CF_2CF_2O)_m(CF_2CF_2CF_2CF_2O)_n(CF(CF_3)CF_2O)_o-(CF(CF_3))_y(CF_2)_x- \cdots (1),$$

where x is a real number of 0 to 3, y is a real number of 0 to 1, and z, l, m, n, and o are each a real number of 0 to 15 such that either x or y is a real number of not less than 1 and at least any one of z, l, m, n, and o is a real number of not less than 1.

<3> The lubricant solution according to <1> or <2>, wherein the perfluoropolyether compound is represented by Formula (2) below:

$$R^1-R^2-R^3 \cdots (2),$$

where R^2 is an organic group having a perfluoropolyether skeleton, and R^1 and R^3 are organic groups, and include, independently of each other, a fluorine atom, a hydroxyl group, an alkyl halide group, an alkoxy group, a carboxyl group, an amino group, an ester group, an amide group, or an aryl group at respective terminals thereof.

δ = 1.1 ppm [8H, $HOCH_2CH(OH)CH_2OCH_2CF_2CF_2O(CF_2CF_2CF_2O)_zCF_2CF_2CH_2$-O $CH_2CH(OH)CH_2CH_2CH_2CH_2CH(OH)CH_2O$-$CH_2CF_2CF_2O(CF_2CF_2CF_2O)_zCF_2CF_2CH_2OCH_2CH(OH)CH_2OH$]

Application to a magnetic disk was carried out in a manner similar to that for Example 1 except that Compound 2 thus obtained was dissolved in water at a concentration of 0.35g/L.

[0077]

[Example 6]

A lubricant solution obtained in Example ~~2~~5 was applied to a magnetic disk in a manner similar to that for Example 1 except that the temperature of the lubricant solution was set to 80°C.

[0078]

[Example 7]

Compound 2 was dissolved, at the same concentration as in Example 5, in a mixed solvent obtained by mixing water and acetone in a volume ratio of 50:50, so that a lubricant solution in Example 7 was prepared. This lubricant solution was applied to a magnetic disk in a manner similar to that for Example 5 except that the lubricant solution thus prepared was used.

[0079]

[Example 8]

Claims

~~Claim 1~~

1. A lubricant solution comprising: water; and a perfluoropolyether compound that satisfies Expression (I) below:

$$N_{OH} / (Mn/1500) \geq 2 \cdots (I),$$

where N_{OH} represents the number of hydroxyl groups contained per molecule of the perfluoropolyether compound and Mn represents a number average molecular weight of the perfluoropolyether compound.

~~Claim 2~~

2. The lubricant solution according to claim 1, wherein the perfluoropolyether compound has a structure of Formula (1) below:

$$-(CF_2)_x(CF(CF_3))_yO(CF_2O)_z(CF_2CF_2O)_l(CF_2CF_2CF_2O)_m(CF_2CF_2CF_2CF_2O)_n(CF(CF_3)CF_2O)_o-(CF(CF_3))_y(CF_2)_x- \cdots (1),$$

where x is a real number of 0 to 3, y is a real number of 0 to 1, and z, l, m, n, and o are each a real number of 0 to 15 such that either x or y is a real number of not less than 1 and at least any one of z, l, m, n, and o is a real number of not less than 1.

~~Claim 3~~

3. The lubricant solution according to claim 1 or 2,

wherein the perfluoropolyether compound is represented by Formula (2) below:

R^1-R^2-R^3 · · · (2),

where R^2 is an organic group having a perfluoropolyether skeleton, and

R^1 and R^3 are organic groups, and include, independently of each other, a fluorine atom, a hydroxyl group, an alkyl halide group, an alkoxy group, a carboxyl group, an amino group, an ester group, an amide group, or an aryl group at respective terminals thereof.

~~Claim 4~~

4. The lubricant solution according to any one of claims 1 to 3, further comprising an organic solvent.

~~Claim 5~~

5. The lubricant solution according to any one of claims 1 to 4, wherein the lubricant solution contains a fluorine solvent in an amount of not more than 20 wt%.

~~Claim 6~~

6. A magnetic disk comprising:

a recording layer;

a protective layer disposed on the recording layer; and

a lubricant layer disposed on the protective layer,

the lubricant layer comprising a lubricant solution according to any one of claims 1 to 5.

~~Claim 7~~

7. A method for producing a magnetic disk including a recording layer, a protective layer disposed on the recording layer, and a lubricant layer disposed on the protective layer, the method comprising a step of forming a lubricant layer by placing, on an exposed surface of the protective layer of a stack of the recording layer and the protective layer, a lubricant solution according to any one of claims 1 to 5.