more preferably, diluted to 5 mass% or less. Further, from the viewpoint of cleaning performance, preferably the concentrated liquid of the detergent composition is diluted to 0.005 mass% or more, more preferably 0.3 mass% or more, and further preferably 1 mass% or more.

[0044] [Concentrate of detergent composition]

The concentrated liquid of the detergent composition according to the present disclosure can be prepared by mixing the respective components. The content of each of the components other than water is substantially equivalent to those of a detergent composition. From the viewpoint of storage and transportation, the content of water in the concentrated liquid of the detergent composition is preferably 95.00 mass% or less, and more preferably 90.00 mass% or less, and, from a similar viewpoint, it is preferably 60.00 mass% or more, and more preferably 70.00 mass% or more. Therefore, in one or a plurality of embodiments, the method for cleaning a glass substrate according to the present disclosure includes dilution of the concentrated liquid of the detergent composition.

[0045] From the viewpoint of improving the cleaning performance after dilution, a pH of the concentrated liquid of the detergent composition according to the present disclosure is preferably 8.80 or more, more preferably 9.00 or more, and further preferably 10.00 or more. It is preferably 12.50 or less, more preferably 12.00 or less, and further preferably 11.00 or less, from the viewpoint of suppressing aggravation of the surface roughness after cleaning. The pH of the concentrated liquid of the detergent composition can be measured by a method similar to the method for measuring a pH of a detergent composition.

[0046] [Method for cleaning glass substrate]

The method for cleaning a glass substrate according to the present disclosure is a method for polishing a crystallized glass substrate to be polished that is made of a crystallized glass by use of the detergent composition according to the present disclosure, and in one or a plurality of embodiments, the method includes a step of bringing the detergent composition according to the present disclosure into contact with the crystallized glass substrate to be cleaned. Examples of one or a plurality of embodiments of this step include (a) a method of immersing the crystallized glass substrate to be cleaned that is made of a crystallized glass in the detergent

CLAIMS

[1] A method for producing a glass hard disk substrate, comprising steps (1) and (2) below:

step (1) of polishing a glass substrate to be polished by use of a polishing liquid composition; and

step (2) of cleaning the substrate obtained in step (1) by use of a detergent composition,

wherein the detergent composition contains an amine including 1 to 10 nitrogen atoms and an inorganic alkali,

a content of the amine is in a range of 5.00 mass% to 70.00 mass% relative to the total mass of components of the detergent composition other than water,

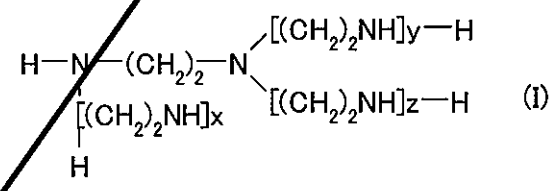
the glass substrate to be cleaned is a crystallized glass substrate, and

a pH of the detergent during cleaning is in a range of 9.00 to 11.50.

[2] The method for producing a glass hard disk substrate according to claim 1, wherein the detergent composition is a polishing liquid composition including silica particles.

[3] The method for producing a glass hard disk substrate according to claim 1 or 2, wherein the detergent composition contains an alkali metal derived from an inorganic alkali, and the mass ratio of the amine to an alkali metal ion in the detergent composition (content of amine) / (content of alkali metal ion) is in a range of 0.50 to 12.00.

[4] The method for producing a glass hard disk substrate according to any one of claims 1 to 3, wherein the amine is at least one selected from the group consisting of a compound represented by General Formula (I), alkanolamine, and a compound having a piperazine ring:



(I)

[in Formula (I), x, y and z respectively denote integers in a range of 0 to 4, satisfying $1 \leq x+y+z \leq 4$].

[5] The method for producing a glass hard disk substrate according to any one of

claims 1 to 4, wherein the amine is at least one selected from the group consisting of: tetraethylenepentamine, pentaethylenehexamine, monoethanolamine, 2-[(2-aminoethyl)amino]ethanol, and 1-(2-hydroxyethyl)piperazine.

[6] The method for producing a glass hard disk substrate according to any one of claims 1 to 5, wherein the detergent composition contains further a nonionic surfactant represented by General Formula (II) below:

R-O-(EO)o(PO)p-H (II)

[in Formula (II), R is a linear or branched alkyl group having 6-16 carbon atoms, o is an average number of added moles of EO, and p is an average number of added moles of PO; o is a number in a range of 0 to 20, and p is a number in a range of 0 to 5].

[7] The method for producing a glass hard disk substrate according to claim 6, wherein a content of the nonionic surfactant is in a range of 1.00 mass% to 5.00 mass% relative to the total mass of the components other than water.

[8] The method for producing a glass hard disk substrate according to any one of claims 1 to 7, wherein the detergent composition further contains at least one solubilizer selected from the group consisting of: organic sulfonic acids such as p-toluenesulfonic acid, dimethylbenzenesulfonic acid, and the like; 2-ethylhexanoic acid; and salts thereof.

[9] The method for producing a glass hard disk substrate according to claim 8, wherein a content of the solubilizer is in a range of 20.00 mass% to 62.00 mass% relative to the total mass of the components other than water.

[10] The method for producing a glass hard disk substrate according to any one of claims 1 to 9, wherein the detergent composition contains further an anionic polymer.

[11] The method for producing a glass hard disk substrate according to claim 10, wherein a content of the anionic polymer is in a range of 2.50 mass% to 7.50 mass% relative to the total mass of the components other than water.

[12] The method for producing a glass hard disk substrate according to any one of claims 1 to 11, wherein the detergent composition contains further a chelating agent.

[13] The method for producing a glass hard disk substrate according to claim 12, wherein a content of the chelating agent is in a range of 3.80 mass% to 10.60 mass% relative to the total mass of the components other than water.

[14] The method for producing a glass hard disk substrate according to any one of

claims 1 to 13, comprising diluting a concentrated liquid of the detergent composition containing water in a range of 60.00 mass% to 95.00 mass%.

[15] A method for cleaning a glass substrate, comprising a step of bringing a detergent composition into contact with a glass substrate to be cleaned,

wherein the detergent composition contains an amine including 1 to 10 nitrogen atoms and an inorganic alkali,

a content of the amine is in a range of 5.00 mass% to 70.00 mass% relative to the total mass of components of the detergent composition other than water,

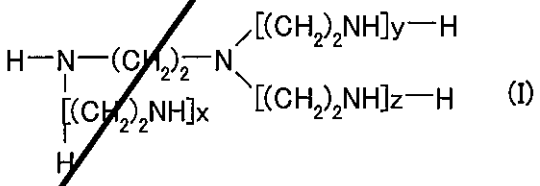
the glass substrate to be cleaned is a crystallized glass substrate, and

a pH of the detergent composition during cleaning is in a range of 9.00 to 11.50.

[16] The method for cleaning a glass substrate according to claim 15, wherein the crystallized glass substrate to be cleaned is a substrate that has been polished with silica particles.

[17] The method for cleaning a glass substrate according to claim 16 or 17, wherein the detergent composition contains an alkali metal derived from the inorganic alkali, and the mass ratio of the amine to an alkali metal ion in the detergent composition (content of amine) / (content of alkali metal ion) is in a range of 0.50 to 12.00.

[18] The method for cleaning a glass substrate according to any one of claims 15 to 17, wherein the amine is at least one selected from the group consisting of a compound represented by General Formula (I), alkanolamine, and a compound having a piperazine ring:



(I)

[in Formula (I), x, y and z respectively denote integers in a range of 0 to 4, satisfying $1 \leq x+y+z \leq 4$].

[19] The method for cleaning a glass substrate according to any one of claims 15 to 18, comprising diluting a concentrated liquid of the detergent composition containing water in a range of 60 mass% to 95 mass%.

[20] The method for cleaning a glass substrate according to any one of claims 15 to 19, wherein the glass substrate to be cleaned is a glass substrate for a glass hard disk substrate.

more preferably, diluted to 5 mass% or less. Further, from the viewpoint of cleaning performance, preferably the concentrated liquid of the detergent composition is diluted to 0.005 mass% or more, more preferably 0.3 mass% or more, and further preferably 1 mass% or more.

[0044] [Concentrate of detergent composition]

The concentrated liquid of the detergent composition according to the present disclosure can be prepared by mixing the respective components. The content of each of the components other than water is substantially equivalent to those of a detergent composition. From the viewpoint of storage and transportation, the content of water in the concentrated liquid of the detergent composition is preferably 95.00 mass% or less, and more preferably 90.00 mass% or less, and, from a similar viewpoint, it is preferably 60.00 mass% or more, and more preferably 70.00 mass% or more. Therefore, in one or a plurality of embodiments, the method for cleaning a glass substrate according to the present disclosure includes dilution of the concentrated liquid of the detergent composition.

[0045] From the viewpoint of improving the cleaning performance after dilution, a pH of the concentrated liquid of the detergent composition according to the present disclosure is preferably 8.80 or more, more preferably 9.00 or more, and further preferably 10.00 or more. It is preferably 12.50 or less, more preferably 12.00 or less, and further preferably 11.00 or less, from the viewpoint of suppressing aggravation of the surface roughness after cleaning. The pH of the concentrated liquid of the detergent composition can be measured by a method similar to the method for measuring a pH of a detergent composition.

[0046] [Method for cleaning glass substrate]

The method for cleaning a glass substrate according to the present disclosure is a method for cleaning a crystallized glass substrate to be cleaned that is made of a crystallized glass by use of the detergent composition according to the present disclosure, and in one or a plurality of embodiments, the method includes a step of bringing the detergent composition according to the present disclosure into contact with the crystallized glass substrate to be cleaned. Examples of one or a plurality of embodiments of this step include (a) a method of immersing the crystallized glass substrate to be cleaned that is made of a crystallized glass in the detergent

CLAIMS

[1] A method for producing a glass hard disk substrate, comprising steps (1) and (2) below:

step (1) of polishing a glass substrate to be polished by use of a polishing liquid composition; and

step (2) of cleaning the substrate obtained in step (1) by use of a detergent composition,

wherein the detergent composition contains an amine including 1 to 10 nitrogen atoms and an inorganic alkali,

a content of the amine is in a range of 5.00 mass% to 70.00 mass% relative to the total mass of components of the detergent composition other than water,

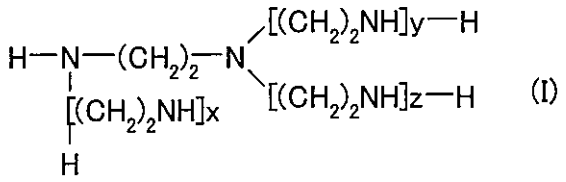
a mass ratio of the amine to an alkali metal ion derived from the inorganic alkali [(content of amine) / (content of alkali metal ion)] is in a range of 0.50 to 12.00,

the glass substrate to be cleaned is a crystallized glass substrate, and

a pH of the detergent during cleaning is in a range of 9.00 to 11.50.

[2] The method for producing a glass hard disk substrate according to claim 1, wherein the detergent composition is a polishing liquid composition including silica particles.

[3] The method for producing a glass hard disk substrate according to claims 1 or 2, wherein the amine is at least one selected from the group consisting of a compound represented by General Formula (I), alkanolamine, and a compound having a piperazine ring:



(I)

[in Formula (I), x, y and z respectively denote integers in a range of 0 to 4, satisfying $1 \leq x+y+z \leq 4$].

[4] The method for producing a glass hard disk substrate according to any one of claims 1 to 3, wherein the amine is at least one selected from the group consisting of: tetraethylenepentamine, pentaethylenehexamine, monoethanolamine,

2-[(2-aminoethyl)amino]ethanol, and 1-(2-hydroxyethyl)piperazine.

[5] The method for producing a glass hard disk substrate according to any one of claims 1 to 4, wherein the detergent composition contains further a nonionic surfactant represented by General Formula (II) below:

R-O-(EO)o(PO)p-H (II)

[in Formula (II), R is a linear or branched alkyl group having 6-16 carbon atoms, o is an average number of added moles of EO, and p is an average number of added moles of PO; o is a number in a range of 0 to 20, and p is a number in a range of 0 to 5].

[6] The method for producing a glass hard disk substrate according to claim 5, wherein a content of the nonionic surfactant is in a range of 1.00 mass% to 5.00 mass% relative to the total mass of the components other than water.

[7] The method for producing a glass hard disk substrate according to any one of claims 1 to 6, wherein the detergent composition further contains at least one solubilizer selected from the group consisting of: organic sulfonic acids such as p-toluenesulfonic acid, dimethylbenzenesulfonic acid, and the like; 2-ethylhexanoic acid; and salts thereof.

[8] The method for producing a glass hard disk substrate according to claim 7, wherein a content of the solubilizer is in a range of 20.00 mass% to 62.00 mass% relative to the total mass of the components other than water.

[9] The method for producing a glass hard disk substrate according to any one of claims 1 to 8, wherein the detergent composition contains further an anionic polymer.

[10] The method for producing a glass hard disk substrate according to claim 9, wherein a content of the anionic polymer is in a range of 2.50 mass% to 7.50 mass% relative to the total mass of the components other than water.

[11] The method for producing a glass hard disk substrate according to any one of claims 1 to 10, wherein the detergent composition contains further a chelating agent.

[12] The method for producing a glass hard disk substrate according to claim 11, wherein a content of the chelating agent is in a range of 3.80 mass% to 10.60 mass% relative to the total mass of the components other than water.

[13] The method for producing a glass hard disk substrate according to any one of claims 1 to 12, comprising diluting a concentrated liquid of the detergent composition

containing water in a range of 60.00 mass% to 95.00 mass%.

[14] A method for cleaning a glass substrate, comprising a step of bringing a detergent composition into contact with a glass substrate to be cleaned,

wherein the detergent composition contains an amine including 1 to 10 nitrogen atoms and an inorganic alkali,

a content of the amine is in a range of 5.00 mass% to 70.00 mass% relative to the total mass of components of the detergent composition other than water,

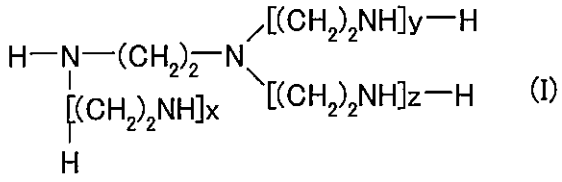
a mass ratio of the amine to an alkali metal ion derived from the inorganic alkali [(content of amine) / (content of alkali metal ion)] is in a range of 0.50 to 12.00,

the glass substrate to be cleaned is a crystallized glass substrate, and

a pH of the detergent composition during cleaning is in a range of 9.00 to 11.50.

[15] The method for cleaning a glass substrate according to claim 14, wherein the glass substrate to be cleaned is a substrate obtained by subjecting a glass substrate to be polished to a polishing with silica particles.

[16] The method for cleaning a glass substrate according to claim 14 or 15, wherein the amine is at least one selected from the group consisting of a compound represented by General Formula (I), alkanolamine, and a compound having a piperazine ring:



(I)

[in Formula (I), x, y and z respectively denote integers in a range of 0 to 4, satisfying $1 \leq x+y+z \leq 4$].

[17] The method for cleaning a glass substrate according to any one of claims 14 to 16, comprising diluting a concentrated liquid of the detergent composition containing water in a range of 60 mass% to 95 mass%.

[18] The method for cleaning a glass substrate according to any one of claims 14 to 17, wherein the glass substrate to be cleaned is a glass substrate for a glass hard disk substrate.