DESCRIPTION

MANUFACTURING METHOD OF GLASS SUBSTRATE FOR MAGNETIC DISK AND MANUFACTURING METHOD OF MAGNETIC DISK

TECHNICAL FIELD

[0001] The present invention relates to a manufacturing method of glass substrate for magnetic disk used in a magnetic disk device such as hard disk device (HDD), and a manufacturing method of a magnetic disk using such glass substrate.

BACKGROUND ART

[0002] Recently, a glass substrate is used as one of the substrate for magnetic disk suited to high-density recording. The glass substrate is higher in rigidity as compared with a metal substrate, and is suited to application in high speed rotation of a magnetic disk device. Moreover, the glass substrate is capable of obtaining a smooth and flat surface, and is suited to application for higher S/N ratio and higher recording density, by lowering the floating amount of the magnetic head.

[0003] Generally, the glass substrate for magnetic disk is manufactured by executing sequentially a process of heating and melting a glass material to prepare molten glass, a process of forming this molten glass into a glass disk, and a process of processing and polishing the glass disk formed into a plate and manufacturing a glass substrate.

[0004] The process of forming the molten glass into a plate-shaped glass

Claims

1. A manufacturing method of glass substrate for magnetic disk having a surface grinding process for processing a mirror-smooth plate glass having a mirror-smooth surface on the principal surface, to a desired flatness and surface roughness by using fixed abrasive grains,

wherein the surface grinding process using the fixed abrasive grains is preceded by a roughening process of roughening the mirror-smooth plate glass surface to a degree capable of being polished by the fixed abrasive grains by a mechanical method or a chemical method.

2. The manufacturing method of glass substrate for magnetic disk according to claim 1, wherein the roughening process is realized by the mechanical method of polishing and processing by using free abrasive grains.

3. The manufacturing method of glass substrate for magnetic disk according to claim 1, wherein the roughening process is realized by the chemical method having an etching action by using a chemical solution.

4. The manufacturing method of glass substrate for magnetic disk according to claim 3, the chemical method having an etching action by using

a chemical solution is a frosting process.

5. The manufacturing method of glass substrate for magnetic disk according to any one of claim 1 to 4, wherein the roughening process is characterized by roughening the mirror-smooth plate glass surface having a mirror-smooth surface roughness of Ra = 0.001 μm or less, to surface roughness of Ra = 0.01 to 0.4 μm.

6. The manufacturing method of glass substrate for magnetic disk according to any one of claim 1 to 5, wherein the roughening process is characterized by roughening the mirror-smooth plate glass to the condition of $B/A < 50$, where A is the surface roughness of the glass and B is the average particle size of the fixed abrasive grains.

7. The manufacturing method of glass substrate for magnetic disk according to any one of claim 1 to 6, wherein the process of processing the mirror-surface plate glass surface by using the fixed abrasive grains is characterized by processing to the surface roughness of Ra = 0.1 μm or less and the flatness of 7 μm or less.

8. A manufacturing method of magnetic disk for forming at least a magnetic

layer on a principal surface of a glass substrate for magnetic disk manufactured by the manufacturing method of glass substrate for magnetic disk of any one of claims 1 to 7.

9. A manufacturing method of glass substrate for magnetic disk having a surface grinding process for processing a plate glass manufactured by the float process, to a desired flatness and surface roughness by using fixed abrasive grains,

wherein the surface grinding process using the fixed abrasive grains is preceded by a roughening process of roughening the plate glass surface.

10. The manufacturing method of glass substrate for magnetic disk according to claim 9, wherein the roughening process is realized by a mechanical method or a chemical method.

11. The manufacturing method of glass substrate for magnetic disk according to claim 9, wherein the roughened plate glass is grinded by using a pad having diamond particles as the fixed abrasive grains in the surface grinding process.

12. The manufacturing method of glass substrate for magnetic disk

according to claim 10, wherein the roughening process is realized by the mechanical method of processing by using free abrasive grains.

13. The manufacturing method of glass substrate for magnetic disk according to claim 10, wherein the roughening process is realized by the chemical method having an etching action by using a chemical solution.

14. The manufacturing method of glass substrate for magnetic disk according to claim 13, the chemical method having an etching action by using a chemical solution is a frosting process.

15. The manufacturing method of glass substrate for magnetic disk according to any one of claim 9 to 14, wherein the roughening process is characterized by roughening the plate glass surface having surface roughness of Ra = 0.01 μm or less, to surface roughness of Ra = 0.01 μm or more.

16. The manufacturing method of glass substrate for magnetic disk according to any one of claim 9 to 15, wherein the roughening process is characterized by roughening the plate glass to the condition of $B/A < 50$, where A is the surface roughness of the glass and B is the average particle size of the fixed abrasive grains.

17. The manufacturing method of glass substrate for magnetic disk according to any one of claim 9 to 16, wherein the surface grinding process is characterized by processing to the surface roughness of Ra = 0.1 μm or less and the flatness of 7 μm or less.

18. A manufacturing method of magnetic disk for forming at least a magnetic layer on a principal surface of a glass substrate for magnetic disk manufactured by the manufacturing method of glass substrate for magnetic disk of any one of claims 9 to 17.

19. A manufacturing method of a plate glass material for magnetic disk glass substrate, comprising the steps of:

roughening a surface of a plate glass, a plate glass manufactured by float process; and

grinding the roughened plate glass surface using fixed abrasive grains to a desired flatness and a surface roughness.

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[0004] The process of forming the molten glass into a plate-shaped glass

Claims

1. A manufacturing method of glass substrate for magnetic disk having a surface grinding process for processing a mirror-smooth plate glass having a mirror-smooth surface on the principal surface, to a desired flatness and surface roughness by using fixed abrasive grains,

wherein the surface grinding process using the fixed abrasive grains is preceded by a roughening process of roughening the mirror-smooth plate glass surface to a degree capable of being polished by the fixed abrasive grains by a mechanical method or a chemical method.

2. The manufacturing method of glass substrate for magnetic disk according to claim 1, wherein the roughening process is realized by the mechanical method of polishing and processing by using free abrasive grains.

3. The manufacturing method of glass substrate for magnetic disk according to claim 1, wherein the roughening process is realized by the chemical method having an etching action by using a chemical solution.

4. The manufacturing method of glass substrate for magnetic disk according to claim 3, the chemical method having an etching action by using

a chemical solution is a frosting process.

5. The manufacturing method of glass substrate for magnetic disk according to any one of claim 1 to 4, wherein the roughening process is characterized by roughening the mirror-smooth plate glass surface having a mirror-smooth surface roughness of Ra = 0.001 μm or less, to surface roughness of Ra = 0.01 to 0.4 μm.

6. The manufacturing method of glass substrate for magnetic disk according to any one of claim 1 to 5, wherein the roughening process is characterized by roughening the mirror-smooth plate glass to the condition of $B/A < 50$, where A is the surface roughness of the glass and B is the average particle size of the fixed abrasive grains.

7. The manufacturing method of glass substrate for magnetic disk according to any one of claim 1 to 6, wherein the process of processing the mirror-surface plate glass surface by using the fixed abrasive grains is characterized by processing to the surface roughness of Ra = 0.1 μm or less and the flatness of 7 μm or less.

8. A manufacturing method of magnetic disk for forming at least a magnetic

layer on a principal surface of a glass substrate for magnetic disk manufactured by the manufacturing method of glass substrate for magnetic disk of any one of claims 1 to 7.

9. A manufacturing method of glass substrate for magnetic disk having a surface grinding process for processing a plate glass manufactured by the float process, to a desired flatness and surface roughness by using fixed abrasive grains,

wherein the surface grinding process using the fixed abrasive grains is preceded by a roughening process of roughening the plate glass surface.

10. The manufacturing method of glass substrate for magnetic disk according to claim 9, wherein the roughening process is realized by a mechanical method or a chemical method.

11. The manufacturing method of glass substrate for magnetic disk according to claim 9, wherein the roughened plate glass is grinded by using a pad having diamond particles as the fixed abrasive grains in the surface grinding process.

12. The manufacturing method of glass substrate for magnetic disk

according to claim 10, wherein the roughening process is realized by the mechanical method of processing by using free abrasive grains.

13. The manufacturing method of glass substrate for magnetic disk according to claim 10, wherein the roughening process is realized by the chemical method having an etching action by using a chemical solution.

14. The manufacturing method of glass substrate for magnetic disk according to claim 13, the chemical method having an etching action by using a chemical solution is a frosting process.

15. The manufacturing method of glass substrate for magnetic disk according to any one of claim 9 to 14, wherein the roughening process is characterized by roughening the plate glass surface having surface roughness of Ra = 0.01 μm or less, to surface roughness of Ra = 0.01 μm or more.

16. The manufacturing method of glass substrate for magnetic disk according to any one of claim 9 to 15, wherein the roughening process is characterized by roughening the plate glass to the condition of $B/A < 50$, where A is the surface roughness of the glass and B is the average particle size of the fixed abrasive grains.

17. The manufacturing method of glass substrate for magnetic disk according to any one of claim 9 to 16, wherein the surface grinding process is characterized by processing to the surface roughness of Ra = 0.1 μm or less and the flatness of 7 μm or less.

18. A manufacturing method of magnetic disk for forming at least a magnetic layer on a principal surface of a glass substrate for magnetic disk manufactured by the manufacturing method of glass substrate for magnetic disk of any one of claims 9 to 17.

19. A manufacturing method of glass disk for magnetic disk glass substrate having a surface grinding process for processing a plate glass manufactured by the float process, to a desired flatness and surface roughness by using fixed abrasive grains,
comprising the steps of:
roughening the plate glass surface to obtain a disk, and
grinding the roughened disk using the fixed abrasive grains.