transmittance.

Embodiments of the present invention apply a specific resin to the surface on the polishing surface side of the light-transmitting resin member to suppress large variations in light transmittance between the presence and absence of slurry on the surface of the light-transmitting resin member, making it possible to determine the polishing endpoint more accurately.

The first to fourth aspects of the present inventions provide the following.

According to a first aspect of the present invention, there is provided a polishing pad including:

a light-transmitting member; and

a polishing layer, wherein

the polishing layer includes a polishing surface for polishing an object to be polished, and the polishing pad includes a through hole penetrating from the polishing surface to an opposite surface thereof,

the light-transmitting member is arranged so that the light-transmitting member is in the through hole when viewed from the polishing surface side of the polishing pad in a thickness direction of the polishing pad,

when the polishing surface is an upper surface and the opposite surface thereof is a lower surface, the top portion of the light-transmitting member is lower than the polishing surface,

the surface on the polishing surface side of the light-transmitting member is subjected to hydrophilic treatment by plasma treatment or roll blasting treatment, and

a water contact angle of a surface on the polishing surface side of the light-transmitting member is 80 degrees or less.

In an embodiment, a surface of the light-transmitting member opposite to the polishing surface has a water contact angle greater than 80 degrees.

According to a second aspect of the present invention, there is provided a polishing pad including: a light-transmitting member; and a polishing layer, wherein

the polishing layer includes a polishing surface for polishing an object to be polished, and the polishing pad includes a through hole penetrating from the polishing surface to an opposite surface thereof,

the light-transmitting member is arranged so that the light-transmitting member is in the through hole when viewed from the polishing surface side of the polishing pad in a thickness direction of the polishing pad,

when the polishing surface is an upper surface and the opposite surface thereof is a lower surface, the top portion of the light-transmitting member is lower than the polishing surface,

a surface on the polishing surface side of the light-transmitting member is coated with a hydrophilic resin,

the hydrophilic resin is a resin having an ion-bonding hydrophilic group,

in the resin having an ion-bonding hydrophilic group, a cationic moiety of the ion-bonding hydrophilic group is covalently bonded to a monomer constituting the resin and is ion-bonded to an anionic moiety of the ion-bonding hydrophilic group, and

the polishing layer is a polyurethane sheet having open cells containing multiple teardrop-shaped cells, with some or all of the cells being connected by communicating holes.

In an embodiment, the resin having an ion-bonding hydrophilic group is a resin having an ion-bonding hydrophilic group in a side chain thereof.

In an embodiment, the ion-bonding hydrophilic group contains an ammonium cation.

In an embodiment, the resin-coated surface on the polishing surface side of the light-transmitting member has a water contact angle of 50 degrees or less.

According to a third aspect of the present invention, there is provided a polishing pad including: a light-transmitting resin member; and a polishing layer, wherein

the polishing layer includes a polishing surface for polishing an object to be polished, and the polishing pad includes a through hole penetrating from the polishing surface to an opposite surface thereof,

the light-transmitting resin member is arranged so that the light-transmitting resin member is in the through hole when viewed from the polishing surface side of the polishing pad in a thickness direction of the polishing pad, and

the light-transmitting resin member includes a hydrophilic monomer graft-polymerized on a surface on the polishing surface side thereof,

the hydrophilic monomer is an acrylic monomer, and

the resin with a grafted surface includes an ion complex formed using a complex-

forming polymer selected from polyethylene glycol, polyvinylpyrrolidone, polyxylylviologen, polyethyleneimine, polyvinyl pyridinium chloride, and polyvinyl benzyltrimethylammonium chloride.

In an embodiment, the surface on the polishing surface side of the light-transmitting resin member has a water contact angle of 80 degrees or less.

According to a fourth aspect of the present invention, there is provided a polishing pad including: a light-transmitting resin member; and a polishing layer, wherein

the polishing layer includes a polishing surface for polishing an object to be polished, and the polishing pad includes a through hole penetrating from the polishing surface to an opposite surface thereof,

the light-transmitting resin member is arranged so that the light-transmitting resin member is in the through hole when viewed from the polishing surface side of the polishing pad in a thickness direction of the polishing pad, and

the light-transmitting resin member includes, at least on a surface on the polishing surface side thereof, a resin containing a structural unit derived from a polyfunctional (meth)acrylate monomer having two or more polymerizable functional groups and having a -C_{2-4} alkylene-O- unit.

In an embodiment, the polyfunctional (meth)acrylate monomer is at least one selected from the group consisting of the following:

a monomer in which a compound having a -C_{2-4} alkylene-O- unit and (meth)acrylic acid are ester-bonded; and

a monomer in which a trihydric or higher alcohol having a C_{2-4} alkylene oxide added thereto and (meth)acrylic acid are ester-bonded.

In an embodiment, the trihydric or higher alcohol is selected from the group consisting of glycerin, diglycerin, triglycerin, trimethylolpropane, ditrimethylolpropane, erythritol, pentaerythritol, and dipentaerythritol.

In an embodiment, the -C_{2-4} alkylene-O- unit is derived from ethylene oxide and/or propylene oxide.

In an embodiment, the polyfunctional (meth)acrylate monomer is at least one selected from the group consisting of polyethylene glycol diacrylate, polypropylene glycol diacrylate, ethoxylated pentaerythritol tetraacrylate, propoxylated pentaerythritol

Claims:

1. A polishing pad comprising:

a light-transmitting member; and

a polishing layer, wherein

the polishing layer includes a polishing surface for polishing an object to be polished, and the polishing pad includes a through hole penetrating from the polishing surface to an opposite surface thereof,

the light-transmitting member is arranged so that the light-transmitting member is in the through hole when viewed from the polishing surface side of the polishing pad in a thickness direction of the polishing pad,

when the polishing surface is an upper surface and the opposite surface thereof is a lower surface, the top portion of the light-transmitting member is lower than the polishing surface,

the surface on the polishing surface side of the light-transmitting member is subjected to hydrophilic treatment by plasma treatment or roll blasting treatment, and

a water contact angle of a surface on the polishing surface side of the light-transmitting member is 80 degrees or less.

2. The polishing pad according to claim 1, wherein the polishing layer has open cells.

3. The polishing pad according to claim 1, wherein a resin constituting the polishing layer is a wet film-formed resin.

4. The polishing pad according to claim 1, wherein a resin constituting the polishing layer is a resin having multiple teardrop-shaped cells.

5. The polishing pad according to claim 1, wherein a surface of the light-transmitting member opposite to the polishing surface has a water contact angle greater than 80 degrees.

6. A polishing pad comprising:

a light-transmitting member; and

a polishing layer, wherein

the polishing layer comprises a polishing surface for polishing an object to be polished, and the polishing pad comprises a through hole penetrating from the polishing surface to an opposite surface thereof,

the light-transmitting member is arranged so that the light-transmitting member is in the through hole when viewed from the polishing surface side of the polishing pad in a thickness direction of the polishing pad,

when the polishing surface is an upper surface and the opposite surface thereof is a lower surface, the top portion of the light-transmitting member is lower than the polishing surface,

a surface on the polishing surface side of the light-transmitting member is coated with a hydrophilic resin,

the hydrophilic resin is a resin having an ion-bonding hydrophilic group,

in the resin having an ion-bonding hydrophilic group, a cationic moiety of the ion-bonding hydrophilic group is covalently bonded to a monomer constituting the resin and is ion-bonded to an anionic moiety of the ion-bonding hydrophilic group, and

the polishing layer is a polyurethane sheet having open cells containing multiple teardrop-shaped cells, with some or all of the cells being connected by communicating holes.

7. The polishing pad according to claim 6, wherein the resin having an ion-bonding hydrophilic group is a resin having an ion-bonding hydrophilic group in a side chain thereof.

8. The polishing pad according to claim 6 or 7, wherein the ion-bonding hydrophilic group contains an ammonium cation.

9. The polishing pad according to any one of claims 6 to 8, wherein the resin-coated surface on the polishing surface side of the light-transmitting member has a water contact angle of 50 degrees or less.

10. A polishing pad comprising:

a light-transmitting resin member; and

a polishing layer, wherein

the polishing layer comprises a polishing surface for polishing an object to be polished, and the polishing pad comprises a through hole penetrating from the polishing surface to an opposite surface thereof,

the light-transmitting resin member is arranged so that the light-transmitting resin member is in the through hole when viewed from the polishing surface side of the polishing pad in a thickness direction of the polishing pad,

the light-transmitting resin member includes a hydrophilic monomer graft-polymerized on a surface on the polishing surface side thereof,

the hydrophilic monomer is an acrylic monomer, and

the resin with a grafted surface includes an ion complex formed using a complex-forming polymer selected from polyethylene glycol, polyvinylpyrrolidone, polyxylylviologen, polyethyleneimine, polyvinyl pyridinium chloride, and polyvinyl benzyltrimethylammonium chloride.

11. The polishing pad according to claim 10, wherein the surface on the polishing surface side of the light-transmitting resin member has a water contact angle of 80 degrees or less.

12. A polishing pad comprising:

a light-transmitting resin member; and

a polishing layer, wherein

the polishing layer includes a polishing surface for polishing an object to be polished, and the polishing pad includes a through hole penetrating from the polishing surface to an opposite surface thereof,

the light-transmitting resin member is arranged so that the light-transmitting resin member is in the through hole when viewed from the polishing surface side of the polishing pad in a thickness direction of the polishing pad, and

the light-transmitting resin member includes, at least on a surface on the polishing surface side thereof, a resin containing a structural unit derived from a polyfunctional (meth)acrylate monomer having two or more polymerizable functional groups and having a -C_{2-4} alkylene-O- unit.

13. The polishing pad according to claim 12, wherein the polyfunctional (meth)acrylate monomer is at least one selected from the group consisting of the following:

a monomer in which a compound having a -C_{2-4} alkylene-O- unit and (meth)acrylic acid are ester-bonded; and

a monomer in which a trihydric or higher alcohol having a C_{2-4} alkylene oxide added thereto and (meth)acrylic acid are ester-bonded.

14. The polishing pad according to claim 13, wherein the trihydric or higher alcohol is selected from the group consisting of glycerin, diglycerin, triglycerin, trimethylolpropane, ditrimethylolpropane, erythritol, pentaerythritol, and dipentaerythritol.

15. The polishing pad according to any one of claims 12 to 14, wherein the -C_{2-4} alkylene-O- unit is derived from ethylene oxide and/or propylene oxide.

16. The polishing pad according to any one of claims 12 to 15, wherein the polyfunctional (meth)acrylate monomer is at least one selected from the group consisting of polyethylene glycol diacrylate, polypropylene glycol diacrylate, ethoxylated pentaerythritol tetraacrylate, propoxylated pentaerythritol tetraacrylate, ethoxylated glycerin triacrylate, propoxylated glycerin triacrylate, ethoxylated trimethylolpropane triacrylate, and propoxylated trimethylolpropane triacrylate.

17. The polishing pad according to any one of claims 10 to 16, wherein when the polishing surface is an upper surface and the opposite surface thereof is a lower surface, the surface on the polishing surface side of the light-transmitting resin member is lower than the polishing surface.

18. The polishing pad according to claims 1 to 17, wherein the polishing surface includes a groove, and when the polishing surface is an upper surface and the opposite surface thereof is a lower surface, a top portion of the light-transmitting member is at the same level as or lower than a bottom portion of the groove.

19. The polishing pad according to any one of claims 1 to 18, wherein

when the through hole of the polishing layer is a first through hole, the polishing pad further includes an additional layer having a second through hole having a smaller equivalent circle diameter than the first through hole,

the additional layer is located opposite the polishing surface of the polishing layer,

when the polishing pad is viewed in the thickness direction from the polishing surface side, the first through hole and the second through hole at least partially overlap each other, and

the light-transmitting member is arranged so that the light-transmitting member is in the first through hole, when viewed from the polishing surface side of the polishing pad in the thickness direction of the polishing pad.