Claims

[Claim 1]

A polishing composition comprising an abrasive grain, a modified microfibril cellulose in which a cellulose unit has a carboxyl group, and a dispersion medium, wherein the modified microfibril cellulose is an ammonium-type modified microfibril cellulose in which a hydrogen atom of the carboxyl group is replaced by ammonium.

[Claim 2]

The polishing composition according to claim 1, wherein the modified microfibril cellulose is a modified microfibril cellulose in which at least a part of the cellulose units has a hydroxyl group at the C6 position oxidized to a carboxyl group.

[Claim 3]

The polishing composition according to claim 1 or 2, wherein each content of Na and K is 100 ppm or less relative to the solids weight.

[Claim 4]

The polishing composition according to any one of claims 1 to 3, wherein each content of Ag, Al, Ca, Cr, Cu, Fe, Mg, Ni, Ti, Zn and Zr is 100 ppm or less relative to the solids weight.

[Claim 5]

The polishing composition according to any one of claims 1 to 4, wherein the modified microfibril cellulose has a carboxyl group content of 0.5 to 2.8 mmol/g.

[Claim 6]

The polishing composition according to any one of claims 1 to 5, wherein the modified microfibril cellulose is a cellulose fiber having a number average fiber diameter of 1 to 100 nm, a number average fiber length of 0.01 to 300 μm, and a ratio of the number average fiber length to the number average fiber diameter (number average fiber length/number average fiber diameter) of 10 to 3000.

[Claim 7]

The polishing composition according to any one of claims 1 to 6, wherein the abrasive grain comprises at least one of cerium oxide, chromium oxide, silica, aluminum oxide, titanium oxide and iron oxide.

[Claim 8]

The polishing composition according to any one of claims 1 to 7, wherein the abrasive grain is a ceria-based composite particulate having a mother particle having amorphous silica as a main component and a silica layer having amorphous silica as a main component provided on the surface of the mother particle, the silica layer having a child particle having crystalline ceria as a main component dispersed therein.

[Claim 9]

The polishing composition according to claim 8, wherein the ceria-based composite particulate has:

an average particle diameter of 50 to 350 nm,

a mass ratio of silica to ceria (M_{SiO2}: M_{CeO2}) of 100:11 to 100:316, and

an average crystallite size of ceria of 10 to 50 nm.

[Claim 10]

The polishing composition according to any one of claim 8 or 9, wherein a flow potential curve obtained by cationic colloid titration is a curve in which the ratio of the amount of change in flow potential (ΔPCD) to the amount (V) of a cation colloid titrant (ΔPCD/V) added at the knick represented by the following formula (1) is -110.0 to - 15.0:

$\Delta PCD/V = (I - C)/V \cdot \cdot \cdot$...Formula (1)

wherein C represents a flow potential (mV) at the knick; I represents a flow potential (mV) at the starting point of the flow potential curve; and V represents the amount (ml) of the cation colloid titrant added at the knick.

[Claim 11]

The polishing composition according to any one of claims 1 to 10, wherein the polishing composition comprises:

an acid component comprising 0.0001 to 0.13 mol/L of an acetic acid group or nitric acid group; and

a base component comprising 0.003 to 0.13 mol/L of ammonium or an amine.

[Claim 12]

The polishing composition according to any one of claims 1 to 11, wherein the polishing composition is used for polishing a semiconductor substrate having a silica film formed thereon.

[Claim 13]

The polishing composition according to any one of claims 1 to 12, wherein a mass ratio of the modified microfibril cellulose to the abrasive grain (modified microfibril cellulose/abrasive grain) is 0.002 to 20.

[Claim 14]

A method of producing a polishing composition comprising an ammonium-type modified microfibril cellulose, comprising: subjecting to ion exchange using an ion exchange resin, a dispersion comprising a modified microfibril cellulose in which at least a part of the cellulose units has a hydroxyl group at the C6 position oxidized to a carboxyl group; and then adding ammonia or an amine and adding an abrasive grain.

[Claim 15]

A method of producing a polishing composition comprising an ammonium-type modified microfibril cellulose, comprising: subjecting to ion exchange with an ion exchange resin, a dispersion comprising a modified microfibril cellulose in which at least a part of the cellulose units has a hydroxyl group at the C6 position

oxidized to a carboxyl group and an abrasive grain; and then adding ammonia or an amine.

[Claim 16]

A method for producing a polished substrate comprising:

a primary polishing step of polishing a substrate with a first polishing composition comprising the polishing composition according to any of claims 1 to 13; and

a secondary polishing step of polishing the substrate with a second polishing composition comprising an abrasive grain and a dispersion medium.

[Claim 17]

The method for producing a polished substrate according to claim 16, wherein the abrasive grain in the first polishing composition and/or the second polishing composition has an average particle diameter of 10 nm or more and 350 nm or less and a number of coarse particles of 0.51 μm or more 100 million particles/mL or less of the abrasive grain on dry basis.

[Claim 18]

The method for producing a polished substrate according to claim 16 or 17, wherein the polishing speed with the first polishing composition is higher by 1.2 times or more than that with the second polishing composition.

[Claim 19]

The method of producing a polished substrate according to any one of claims 16 to 18, comprising using a polishing composition feeding device comprising: a particulate holding means for holding a dispersion comprising an abrasive grain; a cellulose holding means for holding a dispersion comprising a modified microfibril cellulose; a mixing section in communication with the particulate holding means and the cellulose holding means; a discharging means provided downstream of the mixing section; and a filtering means provided between the particulate holding means and the mixing section;

wherein the primary polishing step is a step of feeding the dispersion comprising the abrasive grain from the particulate holding means through the filtering means to the mixing section while feeding the dispersion comprising the modified microfibril cellulose from the cellulose holding means to the mixing section to form the first polishing composition in the mixing section; and feeding the first polishing composition on a polishing pad from the discharging means to polish the first polishing composition; and

wherein the secondary polishing step is a step of feeding the dispersion comprising the abrasive grain as the second polishing composition from the particulate holding means and passing it through the filtering means, and then feeding the second polishing composition from

the discharging means onto the polishing pad to polish the second polishing composition.

[Claim 20]

The method for producing a polished substrate according to any one of claims 16 to 18, comprising using a polishing composition feeding device comprising: a first polishing composition holding means for holding the first polishing composition; a second polishing composition holding means for holding the second polishing composition; a discharging means in communication with the first polishing composition holding means and the second polishing composition holding means; and a filtering means provided between the second polishing composition holding means and the discharging means;

wherein the primary polishing step is a step of feeding the first polishing composition from the first polishing composition holding means and feeding the first polishing composition from the discharging means onto a polishing pad to polish the first polishing composition; and

wherein the secondary polishing step is a step of feeding the second polishing composition from the second polishing composition holding means and passing it through the filtering means, and then feeding the second polishing composition from the discharging means onto the polishing pad to polish the second polishing composition.

[Claim 21]

A method for producing a polished substrate, comprising polishing a substrate by dropping the polishing composition according to any one of claims 1 to 13 onto a polishing pad.

[Claim 22]

The method for producing a polished substrate according to claim 21, wherein an abrasive grain has an average particle diameter of 10 nm or more and 350 nm or less and a number of coarse particles of 0.51 μm or more of 100 million particles/mL or less of the abrasive grain on dry basis.