from 100 to 2000 nm.

In one embodiment, the nonwoven structure having an apparent density of from 0.05 to 0.60 g/cm^3.

[0005]

The present invention also relates to a method for manufacturing the aforementioned cleaning member.

In one embodiment, the manufacturing method includes a step of discharging a solution or a melt of an electrospinning composition into an electric field and spinning the solution or the melt by electrospinning, and thereby forming a deposit of a single fiber.

In one embodiment, the manufacturing method includes a step of pressing the deposit, and thereby forming a nonwoven structure having an apparent density of from 0.05 g/cm^3 to 0.60 g/cm^3.

Brief Description of Drawings

[0006]

[Fig. 1] Fig. 1(a) is a schematic diagram illustrating an entangled state of a single fiber included in a nonwoven structure of a cleaning member according to the present invention, and Fig. 1(b) is a schematic diagram illustrating an arrangement of fibers present on the surface of a fiber sheet according to conventional art.

[Fig. 2] Fig. 2 is a schematic diagram illustrating an embodiment of a cleaning member according to the present invention.

[Fig. 3] Figs. 3(a) to 3(d) are schematic diagrams illustrating other embodiments of cleaning members according to the present invention.

[Fig. 4] Fig. 4 is a schematic diagram illustrating a method for manufacturing a single fiber using a manufacturing device.

[Fig. 5] Figs. 5(a) and 5(b) respectively illustrate images and a graph showing particulate removal performance when cleaning members according to a working example and a comparative example were used for cleaning.

Description of Embodiments

[0007]

CLAIMS

[Claim 1] A cleaning member comprising:

a nonwoven structure, whose shape is retained by entanglement between single fibers having a median fiber diameter of from 100 nm to 2000 nm, and which has an apparent density of from 0.05 g/cm^3 to 0.60 g/cm^3.

[Claim 2] The cleaning member according to claim 1, wherein the single fibers has the median fiber diameter of from250 nm to 900 nm.

[Claim 3] The cleaning member according to claim 1 or 2, wherein the single fibers are not bonded together.

[Claim 4] The cleaning member according to any one of claims 1 to 3, wherein a cross-sectional shape of at least one of the single fibers at a contact point between the single fibers is deformed into a shape that is different from a cross-sectional shape of the single fiber at a non-contact point.

[Claim 5] The cleaning member according to claim 4, being used for cleaning a semiconductor substrate after polishing.

[Claim 6] The cleaning member according to any one of claims 1 to 5, wherein:

the nonwoven structure has a porosity of from 30% to 75%; and

in a pore volume distribution wherein cumulative pore volume is differentiated with respect to a logarithm of pore size, the nonwoven structure has a distribution including a top peak within a pore size range of 50 μm or less and including no top peak within a pore size range of above 50 μm.

[Claim 7] The cleaning member according to any one of claims 1 to 6, wherein the nonwoven structure is a compression-molded product of a deposit formed by entanglement between the single fibers.

[Claim 8] The cleaning member according to any one of claims 1 to 7, further comprising a support, wherein the support and the nonwoven structure are arranged in contact with one another.

[Claim 9] The cleaning member according to any one of claims 1 to 8, wherein:

the nonwoven structure has a sheet-like shape; and

permeation time of a water droplet to permeate into the nonwoven structure is 1 minute or less.

[Claim 10] The cleaning member according to any one of claims 1 to 9, wherein:

permeation time of a water droplet to permeate into the nonwoven structure is 0 or more and 45 second or less.

<Method for measuring permeation time of water droplet>

Two pairs of stainless-steel plates, with a thickness of 10 mm, are used to respectively sandwich and hold both ends of the sheet-like nonwoven structure. In this state, tension is applied to the nonwoven structure, and the nonwoven structure is fixed in a manner separated from a test stage. Then, 15 μL of a droplet of ion-exchanged water is dropped from above onto the fixed nonwoven structure with tension applied thereto. The surface on which the water droplet has been dropped is observed with the eyes, and the time from when the water droplet was dropped until the water droplet becomes completely invisible is considered the water droplet permeation time. The size of the nonwoven structure being measured is 80 mm × 50 mm. The distance between the pairs of stainless-steel plates is set to 50 mm. The nonwoven structure is sandwiched by the plates with tension applied thereto such that the sample does not slacken, and the water droplet is dropped onto the center position from above from a height of 10 mm.

[Claim 11] The cleaning member according to any one of claims 1 to 10, wherein:

the single fiber contains a thermoplastic resin; and

the thermoplastic resin is at least one type selected from the group consisting of polyolefin resins including polyethylene, polypropylene, ethylene-α-olefin copolymer and ethylene-propylene copolymer, polyester resins including polyethylene terephthalate, polyamide resins including polyamide 6 and polyamide 66, vinyl resins including

polyvinyl chloride and polystyrene, and acrylic resins including polyacrylate and polymethyl methacrylate.

[Claim 12] The cleaning member according to claim 11, wherein a content of the thermoplastic resin is from 70 to 98 parts by mass with respect to 100 parts by mass of all constituent components of the single fiber.

[Claim 13] The cleaning member according to any one of claims 1 to 12, wherein the single fiber contains an ionic surfactant.

[Claim 14] The cleaning member according to claim 13, wherein a content of the ionic surfactant is from 2 to 10 parts by mass with respect to 100 parts by mass of all constituent components of the single fiber.

[Claim 15] The cleaning member according to any one of claims 1 to 14, wherein the nonwoven structure has an apparent density of from 0.10 g/cm^3 to 0.55 g/cm^3.

[Claim 16] The cleaning member according to any one of claims 1 to 15, wherein the nonwoven structure has an apparent density of from 0.10 g/cm^3 to 0.4 g/cm^3.

[Claim 17] The cleaning member according to any one of claims 1 to 16, wherein the nonwoven structure has a porosity of from 40% to 70%.

[Claim 18] The cleaning member according to any one of claims 1 to 17, wherein the nonwoven structure has a cumulative pore volume of from 0.8 mL/g to 20 mL/g.

[Claim 19] A method for manufacturing the cleaning member according to any one of claims 1 to 18, the method comprising:

a step of discharging a solution or a melt of an electrospinning composition into an electric field and spinning the solution or the melt by electrospinning, and thereby forming a deposit of a single fiber; and

a step of pressing the deposit, and thereby forming a nonwoven structure having an apparent density of from 0.05 g/cm^3 to 0.60 g/cm^3.

[Claim 20] The method for manufacturing the cleaning member according to claim 19, wherein, in the step of forming a deposit of a single fiber, the melt of the electrospinning composition is discharged into an electric field and the melt is spun by electrospinning.