POLISHING COMPOSITION

TECHNICAL FIELD

[0001] The present invention relates to a polishing composition.

BACKGROUND ART

[0002] During polishing of a silicon wafer by chemical mechanical polishing (CMP), a polishing process with multiple steps, such as three or four steps, is performed to achieve high-precision planarization. The slurry used for the last polishing step usually contains a water-soluble polymer such as hydroxyethyl cellulose (HEC) or polyvinyl alcohol (PVA).

[0003] For example, JP 2012-216723 A discloses a polishing composition containing at least one water-soluble polymer selected from vinyl alcohol-based resins having a 1,2-diol structural unit, and alkali.

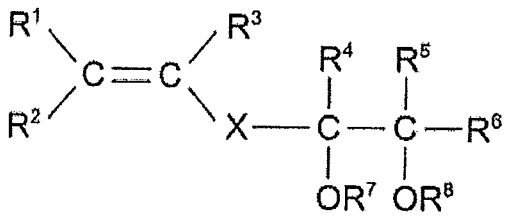
DISCLOSURE OF THE INVENTION

[0004] Recently, demands have been made for suppressing surface defects with respect to stricter standards and reducing "haze" on the surface.

[0005] The present invention was made to solve these problems. An object of the present invention is to provide a polishing composition that can reduce surface defects and haze.

[0006] According to an aspect of the present invention, a polishing composition includes: abrasives; at least one water-soluble polymer selected from vinyl alcohol-based resins having a 1,2-diol structural unit expressed by General Formula (1) provided below; an alkali compound, where an average particle size of particles in the polishing composition measured by dynamic light scattering is not more than 55 nm.

[0007] [Formula 1]



...(1)

(In the formula, each of "R^1", "R^2" and "R^3" independently indicates a hydrogen atom or an organic group; "X" indicates a single bond or a joining

chain; each of "R^4", "R^5" and "R^6" independently indicates a hydrogen atom or an organic group; and each of "R^7" and "R^8" independently indicates a hydrogen atom); and a non-ionic surfactant, wherein the non-ionic surfactant is a diamine compound including an alkylenediamine structure with two nitrogen atoms expressed by General Formula (2) provided below and having at least one block polyether bonded to the two nitrogen atoms of the alkylenediamine structure, where the block polyether is made of an oxyethylene group and an oxypropylene group bonded together,

[Formula 2]



$$\cdots(2)$$

wherein n is an integer equal to or larger than 1.

[0008] According to an embodiment of the present invention, a polishing composition is such that the average particle size of particles in the polishing composition measured by dynamic light scattering is not more than 55 nm. Usually, when the average particle size of particles in the polishing composition is no more than 55 nm, the polished surface becomes hydrophobic, disadvantageously increasing the number of surface defects and/or haze. Further, if the average particle size of particles in the polishing composition is small, particles can easily adhere again to the polished wafer surface due to electric double-layer attraction/repulsion and present particle-type defects, potentially increasing the number of defects. With the above-disclosed polishing composition containing a water-soluble polymer and an alkali compound, the polished surface may be kept hydrophilic even when the size of particles in the polishing composition is reduced. Thus, according to an embodiment of the present invention, the average particle size of particles in the polishing composition is not more than 55 nm to suppress surface defects and reduce haze on the polished silicon wafer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] [FIG. 1] FIG. 1 is a graph showing the relationship between the amount of the alkali compound and the number of defects and haze value for Inventive Examples 7, 13 and 14.

[FIG. 2] FIG. 2 is a graph showing the relationship between the average particle size of abrasives and the number of defects and haze value for Inventive Example 27 and Comparative Examples 7 and 8.

[FIG. 3] FIG. 3 is a graph showing the relationship between the average particle size of particles and the number of defects and haze value for Comparative Examples 9 to 12.

EMBODIMENTS FOR CARRYING OUT THE INVENTION

[0010] Embodiments of the present invention will be described in detail.

[0011] A polishing composition according to an embodiment of the present invention, COMP1, includes: abrasives; at least one water-soluble polymer

CLAIMS

1. A polishing composition comprising:

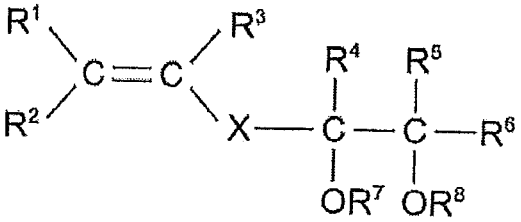
abrasives;

at least one water-soluble polymer selected from vinyl alcohol-based resins having a 1,2-diol structural unit expressed by General Formula (1) provided below;

an alkali compound,

where an average particle size of particles in the polishing composition measured by dynamic light scattering is not more than 55 nm,

[Formula 1]



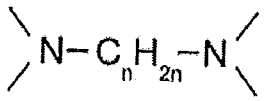
...(1)

(in the formula, each of "R^1", "R^2" and "R^3" independently indicates a hydrogen atom or an organic group; "X" indicates a single bond or a joining chain; each of "R^4", "R^5" and "R^6" independently indicates a hydrogen atom or an organic group; and each of "R^7" and "R^8" independently indicates a hydrogen atom); and

a non-ionic surfactant,

wherein the non-ionic surfactant is a diamine compound including an alkylenediamine structure with two nitrogen atoms expressed by General Formula (2) provided below and having at least one block polyether bonded to the two nitrogen atoms of the alkylenediamine structure, where the block polyether is made of an oxyethylene group and an oxypropylene group bonded together,

[Formula 2]



...(2)

wherein n is an integer equal to or larger than 1.

2. The polishing composition according to claim 1, further comprising a polyalcohol.

3. The polishing composition according to claim 2, wherein the polyalcohol is an alkylene oxide derivative of methylglucoside.