【CLAIMS】

【Claim 1】 An etching composition comprising:

an inorganic acid;

a silanol-based compound; and

a solvent as a remainder,

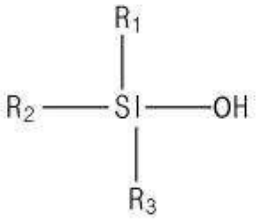
wherein a content of the silanol-based compound ranges from 0.1 parts by weight to less than 10 parts by weight, based on a total weight of the etching composition,

wherein an APHA value is 1.3 or less,

wherein the silanol-based compound is a silanol-based compound represented by following Chemical Formula 1 or a condensate of the silanol-based compound, and

wherein the etching composition is used to etch a silicon nitride layer:

[Chemical Formula 1]



in which, in Chemical Formula 1,

R_1 is selected from the group consisting of an aminoalkyl group having 1 to 20 carbon atoms, an alkoxy group having 1 to 20 carbon atoms, an acetyloxy group, and a haloalkyl acetyloxy group having 1 to 20 carbon atoms, and R_2 and R_3 are hydroxy groups.

【Claim 2】 The etching composition of claim 1, wherein the silanol-based compound is 3-aminopropylsilanetriol or the condensate of the silanol-based compound.

【Claim 3】 The etching composition of claim 1, wherein a CAS number of the

silanol-based compound is 68400-07-7.

【Claim 4】 The etching composition of claim 1, wherein the inorganic acid ranges from 50 parts by weight to 85 parts by weight, based on 100 parts by weight of a whole etching composition.

【Claim 5】 The etching composition of claim 1, wherein the inorganic acid includes:

at least one selected from the group consisting of sulfuric acid, nitric acid, phosphoric acid, silicic acid, hydrofluoric acid, boric acid, hydrochloric acid, and perchloric acid.

【Claim 6】 The etching composition of claim 1, wherein the etching composition further includes:

an ammonium-based compound.

【Claim 7】 The etching composition of claim 6, wherein the ammonium-based compound includes:

at least one selected from the group consisting of ammonium chloride, ammonium phosphate, ammonium acetate, ammonium sulfate, ammonium formate, and a metal amine complex salt.

【Claim 8】The etching composition of claim 1, wherein an etch selectivity of the silicon nitride layer over a silicon oxide layer of the etching composition is at least 30.

【Claim 9】 The etching composition of claim 1, wherein an absolute value of variation of

an etch rate of the nitride layer is at most 20% while the etching process is performed until a silicon ion is in a range from 100 ppm to 1,500 ppm.

【Claim 10】 The etching composition of claim 1, wherein a height of bubbles on a surface of the etching composition is at most 0.5 cm, immediately after the etching composition is formed.

【Claim 11】 The etching composition of claim 1, wherein an etch rate of the silicon nitride layer ranges from 40 to 80 Å/min at an etching process temperature of 165℃.

【Claim 12】 The etching composition of claim 1, wherein an etch rate of a silicon oxide layer is 1 Å/min at an etching process temperature of 165℃.

【Claim 13】 A method for manufacturing a semiconductor device, the method comprising:

forming a structure by stacking an insulating layer and a sacrificial layer on a substrate; and

forming a space region by performing an etching process using the etching composition according to Claim 1 to remove the sacrificial layer.

【Claim 14】 The method of claim 13, wherein the sacrificial layer includes:

a silicon nitride, and

wherein the insulating layer includes:

a silicon oxide layer.

【Claim 15】 The method of claim 13, wherein the sacrificial layer has an etch rate higher

than an etch rate of the insulating layer, in the etching process.