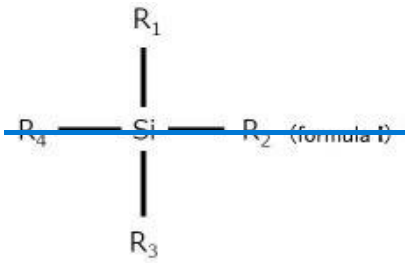
[Claims]

1. A silicon nitride etching liquid composition for producing a 3D non-volatile memory cell, comprising phosphoric acid, one or more kinds of silane coupling agents and water, and not comprising ammonium ions, wherein the silane coupling agent is selected from the group consisting of 3-aminopropyltrimethoxysilane, 3-aminopropyltriethoxysilane, 3-(2-aminoethylamino)propyltrimethoxysilane, 3-(2-aminoethylamino)propyltriethoxysilane, trimethoxy[3-(methylamino)propyl]silane, [3-(N,N-dimethylamino)propyl]trimethoxysilane, trimethoxy[3-(phenylamino)propyl]silane, N-[2-(N-vinylbenzylamino)ethyl]-3-aminopropyltrimethoxysilane, N-[8-(trimethoxysilyl)octyl]ethane-1,2-diamine, N-[3-(trimethoxysilyl)propyl]-1-butaneamine, [3-(diethylamino)propyl]trimethoxysilane, 3-[(1,3-dimethylbutylidene)amino]propyltriethoxysilane, (3-mercaptopropyl)trimethoxysilane, (3-mercaptopropyl)triethoxysilane and N,N-bis[(diphenylphosphino)methyl]-3-(triethoxysilyl)propylamine.

~~2. The etching liquid composition according to claim 1, wherein the silane coupling agent is a compound represented by the formula 1:~~

~~[Chemical formula 1]~~



~~wherein R_1 is an alkyl group or an alkoxy group, R_2 is an alkyl group or an alkoxy group, R_3 is an alkyl group or~~

an alkoxy group, R_4 is a group comprising one or more selected from the group consisting of N atoms, O atoms, S atoms, P atoms, Cl atoms and F atoms.

3. The etching liquid composition according to claim 2, wherein the silane coupling agent is the one in which at least two of R_1, R_2, and R_3 in the formula 1 are alkoxy groups.

4. The etching liquid composition according to claim 2 or 3, wherein the silane coupling agent comprises an amino group or a mercapto group in R_4 of the formula 1.

5. The etching liquid composition according to any one of claims 2 to 4, wherein the silane coupling agent further comprises a phenyl group or an octyl group in R_4 of the formula 1.

6. The etching liquid composition according to any one of claims 2 to 5, wherein the silane coupling agent is selected from the group consisting of 3-aminopropyltrimethoxysilane,3-aminopropyltriethoxysilane, 3-(2aminoethylamino)propyltrimethoxysilane, 3-(2aminoethylamino)propyltriethoxysilane, trimethoxy[3(methylamino)propyl]silane, [3-(N,Ndimethylamino)propyl]trimethoxysilane, trimethoxy[3(phenylamino)propyl]silane, N-[2-(Nvinylbenzylamino)ethyl]-3-aminopropyltrimethoxysilane, N[8-(trimethoxysilyl)octyl]ethane-1,2-diamine, N-[3(trimethoxysilyl)propyl]-1-butaneamine, [3(diethylamino)propyl]trimethoxysilane, 3-[(1,3dimethylbutylidene)amino]propyltriethoxysilane, (3mercaptopropyl)trimethoxysilane, (3mercaptopropyl)triethoxysilane and N,Nbis[(diphenylphosphino)methyl]-3(triethoxysilyl)propylamine.

~~7.~~2. The etching liquid composition according to ~~any one of~~ claim~~s~~ 1 ~~to 6~~, comprising 60 to 95 wt% of phosphoric acid and 0.01 to 10 wt% of a silane coupling agent.

~~8.~~3. The etching liquid composition according to any one of claim~~s~~ 1 or 2~~to 7~~, further comprising one or more kinds of water soluble polar organic solvents.

~~9.~~4. The etching liquid composition according to claim 3~~8~~, wherein the water-soluble polar organic solvent is selected from the group consisting of methanol, ethanol and acetone.

~~10.~~5. The etching liquid composition according to any one of claims 1 to 4~~9~~, further comprising an inorganic silicate.

~~11.~~6. The etching liquid composition according to claim 5~~10~~, wherein the inorganic silicate is sodium silicate or potassium silicate.

~~12.~~7. A method of producing a 3D non-volatile memory cell, which comprises etching silicon nitride using the etching liquid composition according to any one of claims 1 to 6~~11~~.

~~13. A 3D non-volatile memory cell obtained by etching silicon nitride using the etching liquid composition according to any one of claims 1 to 11.~~