CLAIMS

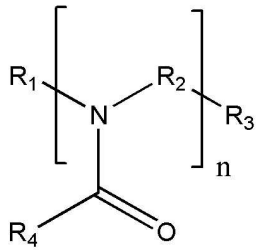
1. A polishing slurry composition for a shallow trench isolation (STI) process, the polishing slurry composition comprising:

a polishing solution comprising abrasive particles; and

an additive solution comprising a polysilicon film polishing inhibitor comprising a polymer having an amide bond,

wherein the polymer is represented by the following Chemical Formula 1:

[Chemical Formula 1]



(wherein n is an integer greater than or equal to 1, R_2 is a simple bond and substituted or unsubstituted C_{1-30} alkylene, alkenylene, cycloalkylene, arylene, arylalkylene or alkynylene, and R_1, R_3 and R_4 are each independently hydrogen, a hydroxyl group, C_{1-30} alkyl group, alkoxy group, aryl group or aralkyl group in which a functional group is substituted or unsubstituted),

wherein the additive solution further comprises an amine compound as an oxide film polishing regulator,

wherein the amine compound further comprises:

at least one amine monomer selected from the group consisting of diethylenetriamine (DETA), triethylenetetramine (TETA), tetraethylenepenpentamine (TEPA), pentaethylenehexamine (PEHA), hexaethyleneheptamine (HEHA), bis(hexamethylene)triamine, N-(3-aminopropyl)ethylenediamine (Am3), N,N'-bis(3-aminopropyl) ethylenediamine (Am4), N,N,N'-tris(3-aminopropyl) ethylenediamine (Am5), N-3-aminopropyl-1,3-diaminopropane, N,N'-bis(3-aminopropyl)-1,3-diaminopropane, N,N,N'-tris(3-aminopropyl)-1,3-diaminopropane, bis-(3-aminopropyl)amine, dipropylenetriamine, and tripropylenetetramine;

at least one amine polymer selected from the group consisting of poly(diethylenetriamine)-co-epichlorohydrin, poly(triethylenetetramine)-co-

epichlorohydrin, tetraethylenepentamine (TEPA)-co-epichlorohydrin, and pentaethylenehexamine (PEHA)-co-epichlorohydrin; or

a combination of both,

wherein the amine compound is present in an amount of 0.1 part per million (ppm) to 1000 ppm in the polishing slurry composition for the STI process,

wherein a polishing selectivity of an insulating film : a polysilicon film ranges from 10 : 1 to 1000 : 1, and

wherein the polishing slurry composition is designed and formulated for a polysilicon film as a polishing stop layer.

2. The polishing slurry composition for the STI process of claim 1, wherein the polymer comprises at least one selected from the group consisting of poly(2-methyl-2-oxazoline), poly(2-methyl-2-oxazoline) having a hydroxyl end, poly(2-methyl-2-oxazoline) having α-benzyl and ω-azide end, poly(2-methyl-2-oxazoline) having an azide end, poly(2-methyl-2-oxazoline) having a piperazine end, poly(2-ethyl-2-oxazoline), poly(2-ethyl-2-oxazoline) having an alkyne end, poly(2-ethyl-2-oxazoline) having α-benzyl and ω-thiol end, poly(2-ethyl-2-oxazoline) having α-methyl and ω-2-hydroxyethylamine end, poly(2-ethyl-2-oxazoline) having an amine end, poly(2-ethyl-2-oxazoline) having a piperazine end, poly(2-propyl-2-oxazoline), poly(2-propyl-2-oxazoline) having an azide end, and derivatives thereof.

3. The polishing slurry composition for the STI process of claim 1, wherein a molecular weight of the polymer is in a range of 1,000 to 5,000,000.

4. The polishing slurry composition for the STI process of claim 1, wherein the polymer is present in an amount of 0.001% by weight (wt %) to 1 wt % in the polishing slurry composition for the STI process.

5. The polishing slurry composition for the STI process of claim 1, wherein the additive solution further comprises at least one acidic material selected from the group consisting of carboxylic acid, nitric acid, hydrochloric acid, phosphoric acid, sulfuric acid, hydrofluoric acid, bromic acid, iodic acid, pimelic acid, malic acid, malonic acid, maleic

acid, acetic acid, adipic acid, oxalic acid, succinic acid, tartaric acid, citric acid, lactic acid, glutaric acid, glycolic acid, formic acid, fumaric acid, propionic acid, butyric acid, hydroxybutyric acid, aspartic acid, itaconic acid, tricarballyic acid, suberic acid, benzoic acid, phenylacetic acid, naphthoic acid, mandelic acid, picolinic acid, nicotinic acid, isonicotinic acid, quinolinic acid, anthranilic acid, fumaric acid, phthalic acid, isophthalic acid, terephthalic acid, pyridinecarboxylic acid, salicylic acid, glutamic acid, polyacrylic acid, a polyacrylic acid copolymer, and polysulfonic acid.

6. The polishing slurry composition for the STI process of claim 1, wherein the additive solution further comprises a basic material; and

the basic material comprises at least one selected from the group consisting of tetramethylammonium hydroxide, ammonia, potassium hydroxide, sodium hydroxide, magnesium hydroxide, rubidium hydroxide, cesium hydroxide, sodium hydrogen carbonate, sodium carbonate, arginine, histidine, lysine, methylamine, ethanolamine, propylamine, butylamine, isopropylamine, monoethanolamine, diethanolamine, triethanolamine, dipropylamine, ethylenediamine, propanediamine, triethylamine, tributylamine, tetramethylamine, triethylenetetramine, tetraethylenepentamine, N-methyldiethanolamine, N-propyldiethanolamine, N-isopropyldiethanolamine, N-(2-methylpropyl)diethanolamine, N-n- butyldiethanolamine, N-t-butylethanolamine, N-cyclohexyldiethanolamine, N,N-bis (2-hydroxypropyl)ethanolamine, triisopropanolamine, 2-amino-2-ethyl-1,3-propanediol, 2-dimethyl amino-2-methyl-1-propanol, 1-dimethylamino-2-propanol, 3-dimethylamino-1-propanol, 2-dimethylamino-1-propanol, 2-diethylamino-1-propanol, 2-diethylamino-1-ethanol, 2-ethylamino-1-ethanol, 1-(dimethylamino)2-propanol, 3-amino-1-propanol, 2-amino-1-propanol, 1-amino-2-propanol, 1-amino-phentanol, 2-(dimethylamino)ethanol, 2-diethylaminoethanol, 2-dipropylaminoethanol, 2-butylaminoethanol, 2-t-butylaminoethanol, 2-cycloaminoethanol, 2-amino-2-phentanol, 2-[bis(2-hydroxyethyl)amino]-2-methyl-1-propanol, 2-[bis(2-hydroxyethyl)amino]-2-propanol, 2-amino-2-methyl-1-propanol, and tris(hydroxymethyl)aminomethane.

7. The polishing slurry composition for the STI process of claim 1, wherein the abrasive particles are prepared using a solid-phase method or a liquid-phase method,

and are dispersed so that a surface of the abrasive particles has positive charges.

8. The polishing slurry composition for the STI process of claim 1, wherein

the abrasive particles comprise at least one selected from the group consisting of a metal oxide, a metal oxide coated with an organic material or inorganic material, and the metal oxide in a colloidal phase, and

the metal oxide comprises at least one selected from the group consisting of silica, ceria, zirconia, alumina, titania, barium titania, germania, mangania and magnesia.

9. The polishing slurry composition for the STI process of claim 1, wherein the abrasive particles comprise a primary particle with a size of 5 nanometers (nm) to 150 nm and a secondary particle with a size of 30 nm to 300 nm.

10. The polishing slurry composition for the STI process of claim 1, wherein the abrasive particles are present in an amount of 0.1 wt % to 10 wt % in the polishing slurry composition for the STI process.

11. The polishing slurry composition for the STI process of claim 1, wherein the polishing slurry composition for the STI process has pH ranging from 3 to 6.

12. The polishing slurry composition for the STI process of claim 1, further comprising water,

wherein a weight ratio of the polishing solution : the water : the additive solution is 1 : 3 to 10 : 1 to 10.

13. The polishing slurry composition for the STI process of claim 1, wherein the polishing slurry composition for the STI process has a zeta-potential of +5 millivolts (mV) to +70 mV.