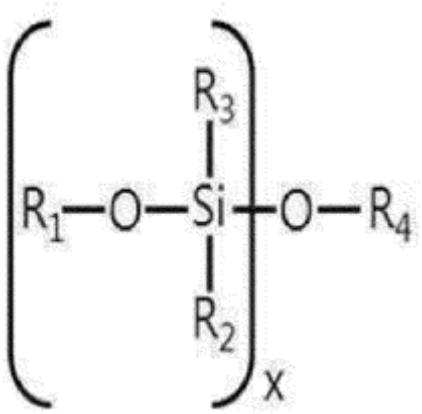


[0018]

[0019] in Chemical Formula 1, X is an integer selected from among 15 to 25, R_1 is selected from the group consisting of H, CH_3, C_2H_5, C_3H_7, C_4H_9 and C_5H_{11}, R_2 is selected from the group consisting of H, CH_3, C_2H_5, C_3H_7, C_4H_9, C_5H_{11}, OCH_3, OC_2H_5, OC_3H_7, OC_4H_9 and OC_5H_{11}, R_3 is selected from the group consisting of H, CH_3, C_2H_5, C_3H_7, C_4H_9, C_5H_{11}, OCH_3, OC_2H_5, OC_3H_7, OC_4H_9 and OC_5H_{11}, and R_4 is selected from the group consisting of CH_2, C_2H_4, C_3H_6, C_4H_8 and C_5H_{10}.

[0020] In a preferred embodiment of the present invention, the anti-reflective coating solution composition further comprises an acid catalyst and a nonionic surfactant.

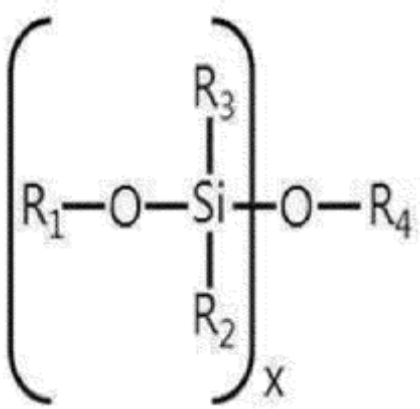
[0021] In a preferred embodiment of the present invention, the water-soluble organic solvent is at least one selected from the group consisting of methyl alcohol, ethyl alcohol, benzyl alcohol, isopropyl alcohol, isoamyl alcohol, pentyl alcohol, isobutyl alcohol, butyl alcohol, cetyl alcohol, lauryl alcohol, nonyl alcohol, undecyl alcohol,

the present invention belongs. Generally, the nomenclature used herein is well known in the art and is typical.

[0032] As used herein, when any part is said to "comprise" or "include" any element, this does not mean that other elements are excluded, and such other elements may be further included unless otherwise specifically mentioned.

[0033] An embodiment of the present invention addresses an anti-reflective coating solution composition, comprising a compound represented by Chemical Formula 1 below, a water-soluble organic solvent, and water.

[0034] [Chemical Formula 1]



[0035]

[0036] in Chemical Formula 1, X is an integer selected from among 15 to 25, R_1 is selected from the group consisting of H, CH_3, C_2H_5, C_3H_7, C_4H_9 and C_5H_{11}, R_2 is selected from the group consisting of H, CH_3, C_2H_5, C_3H_7, C_4H_9, C_5H_{11}, OCH_3, OC_2H_5, OC_3H_7, OC_4H_9 and OC_5H_{11}, R_3 is selected from the group consisting of H, CH_3, C_2H_5, C_3H_7, C_4H_9, C_5H_{11}, OCH_3, OC_2H_5, OC_3H_7,

OC_4H_9 and OC_5H_{11}, and R_4 is selected from the group consisting of CH_2, C_2H_4, C_3H_6, C_4H_8 and C_5H_{10}.

[0037] The compound represented by Chemical Formula 1 is a methyl trimethoxysilane polymer, and when the compound represented by Chemical Formula 1 is dispersed in the water-soluble organic solvent, a sol may result, thereby adjusting the refractive index and abrasion resistance of the anti-reflective coating film.

[0038] The compound represented by Chemical Formula 1 is thermally cured to give a coating film, in which silica particles having a diameter ranging from tens to hundreds of nm are formed and pores are formed between the particles. The formed pores contain air therein and thus when light is transmitted therethrough, the refractive index is adjusted while light passes through the silica layer and the air layer, which have different refractive indices.

[0039] The compound represented by Chemical Formula 1 may have abrasion resistance that varies depending on the degree of polymerization thereof. When the compound represented by Chemical Formula 1, the degree of polymerization of which is a predetermined level or more, is used, abrasion resistance may be improved but the formation of pores is not easy, making it difficult to decrease the refractive index. On the other hand, when the compound represented by Chemical Formula 1, the degree of

set forth to illustrate, but are not to be construed as limiting the scope of the present invention, as will be apparent to those skilled in the art.

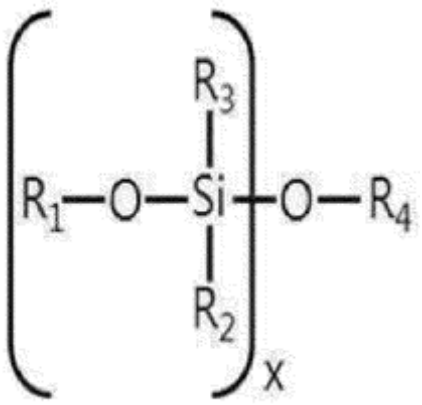
[0060]

[0061] **Example 1**

[0062] An anti-reflective coating solution composition was prepared by mixing 25.0 g of a compound represented by Chemical Formula 1 below (X=5, R_1= CH_3, R_2=OCH_3, R_3=CH_3, R_4= CH_2), 69.5 g of isopropyl alcohol, and 0.5 g of nitric acid with 5 g of water.

[0063]

[0064] [Chemical Formula 1]



[0065]

[0066]

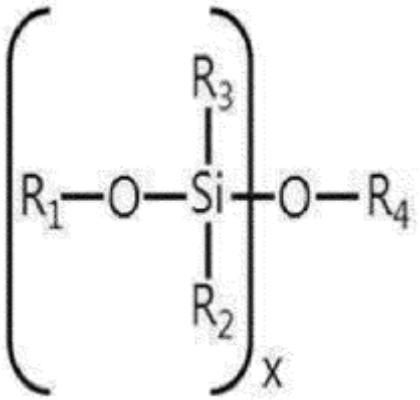
[0067] **Example 2**

[0068] An anti-reflective coating solution composition was prepared by mixing 25.0 g of a compound represented by Chemical Formula 1 (X=15, R_1=CH_3, R_2=OCH_3, R_3=CH_3, R_4=CH_2),

CLAIMS

1. An anti-reflective coating solution composition, comprising, based on a total weight of the composition, 5 to 30 wt% of the compound represented by Chemical Formula 1, 54 to 86 wt% of the water-soluble organic solvent, and a remainder of water:

[Chemical Formula 1]



in Chemical Formula 1, X is an integer selected from among 15 to 25,

R_1 is CH_3,

R_2 is OCH_3,

R_3 is CH_3, and

R_4 is CH_2.

2. The anti-reflective coating solution composition of claim 1, further comprising an acid catalyst and a nonionic

surfactant.

3. The anti-reflective coating solution composition of claim 1, wherein the water-soluble organic solvent is at least one selected from the group consisting of methyl alcohol, ethyl alcohol, benzyl alcohol, isopropyl alcohol, isoamyl alcohol, pentyl alcohol, isobutyl alcohol, butyl alcohol, cetyl alcohol, lauryl alcohol, nonyl alcohol, undecyl alcohol, propylene glycol monomethyl ether, and propylene glycol monomethyl ether acetate.

4. The anti-reflective coating solution composition of claim 2, wherein the acid catalyst is at least one selected from the group consisting of sulfuric acid, hydrochloric acid, sodium nitrate, potassium nitrate, nitric acid, acetic acid, potassium chromate, nitrous acid, perchloric acid, phosphoric acid, and acetic acid.

5. The anti-reflective coating solution composition of claim 2, wherein the nonionic surfactant is at least one selected from the group consisting of polyoxyethylene alkyl phenyl ether, polyoxyethylene alkylether, polyoxyethylene glycol fatty acid ester, an oxypropylene-oxyethylene block copolymer, polyoxyethylene glycol, polyoxyethylene alkylamine ether, polyoxyalkylene glycol monoalkyl ether,

polyoxyalkylene styrenated phenyl ether, and polyoxyalkylene alkylether.

6. The anti-reflective coating solution composition of claim 2, wherein the anti-reflective coating solution composition further comprises, based on the total weight of the composition, 0.5 to 1 wt% of an acid catalyst and 1 to 4 wt% of a nonionic surfactant.

7. The anti-reflective coating solution composition of claim 1, wherein the anti-reflective coating solution composition is used for a solar cell module glass.

8. An anti-reflective coating film, manufactured by coating at least one surface of a solar cell module glass with the anti-reflective coating solution composition of any one of claims 1 to 7 and then performing curing.