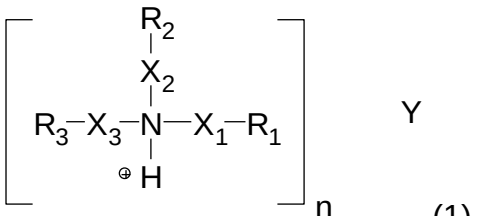
Claims

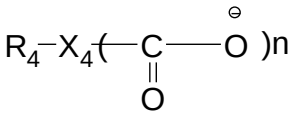
1. An antireflective coating composition comprising a crosslinking agent, a polymer comprising at least one chromophore group and at least one hydroxyl and/or a carboxyl group, and an additive, further where the additive has structure 1 and comprises at least one arylene-hydroxyl moiety,



Y (1)

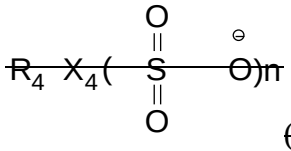
where Y is ~~selected from an~~ a carboxylate anion ~~or sulfonate anion~~, R_1, R_2, and R_3 are independently selected from a group consisting of unsubstituted C_1-C_8 alkyl, substituted C_1-C_8 alkyl, aryl and arylene-hydroxyl; X_1, X_2, and X_3 are independently selected from a group consisting of direct valence bond and C_1-C_8 alkylene group~~,~~ ; and, n = 1, 2 or 3.

2. The composition of claim 1, where Y is structure 2,



(2)

where R_4 is selected from a group consisting of unsubstituted C_1-C_8 alkyl, substituted C_1-C_8 alkyl, aryl, unsubstituted C_1-C_8 alkylene, substituted C_1-C_8 alkylene, arylene, arylene-hydroxyl and mixtures thereof; X_4 is a direct valence bond or a C_1-C_8 alkylene group; and, n = 1, 2 or 3. ~~or where Y is structure 3,~~

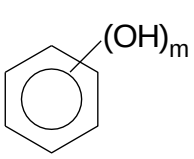


(3)

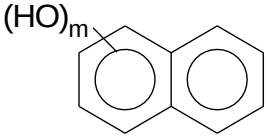
where R_4 is selected from a group consisting of C_1-C_8 alkyl, aryl, C_1-C_8 alkylene, arylene, arylene-hydroxyl and mixtures thereof; X_4 is a direct valence bond or a C_1-C_8 alkylene group; and, n = 1, 2 or 3.

3. The composition of claim 2, where R_4 is an arylene-hydroxyl moiety.

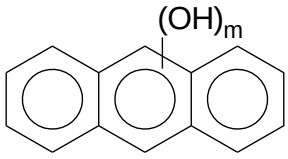
3. 4. The composition of claim 1 or 2, where the arylene-hydroxyl moiety is selected from a group consisting of structure 4, 5 and 6,



(2)



(3)

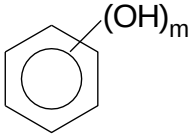


(4)

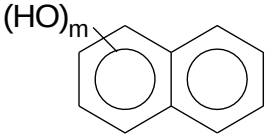
where m=1, 2 or 3.

5. The composition of claim 1, where Y comprises an arylene-hydroxyl moiety.

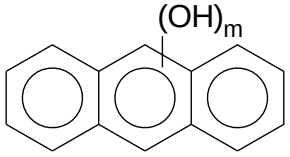
4. 6. The composition of one of claims 1 to 3, where Y comprises an arylene-hydroxyl moiety selected from a group consisting of structures 2, 3 and 4



(2)



(3)

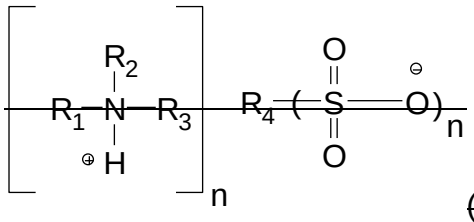


(4)

where m=1, 2 or 3.

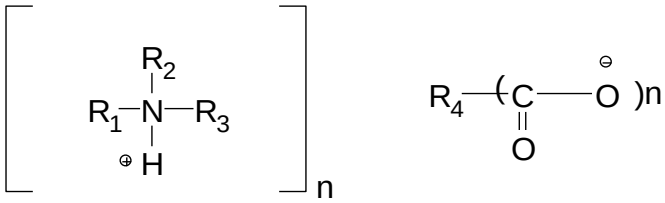
~~5.~~ 7. The composition of ~~one of~~ claim~~s~~ 1 ~~to 4~~, where at least one of R_1, R_2, and R_3 is an arylene- hydroxyl moiety.

~~6.~~ 8. The composition of ~~one of~~ claim~~s~~ 1 ~~to 5~~, where the additive is of structure ~~10~~ 12,



~~(10)~~

~~where R_1, R_2, and R_3 are independently selected from C_1-C_8 alkyl, aryl and arylene-hydroxyl; R_4 is selected from a group consisting of C_1-C_8 alkyl, aryl, C_1-C_8 alkylene, arylene, arylene-hydroxyl and mixtures thereof; and, n = 1, 2 or 3, further where at least one of R_1, R_2, R_3, and R_4 is an arylene-hydroxy group where the additive is of structure 12,~~



(12)

where R_1, R_2, and R_3 are independently selected from a group consisting of C_1-C_8 alkyl, aryl and arylene-hydroxyl; R_4 is selected from a group consisting of C_1-C_8 alkyl, aryl, C_1-C_8 alkylene, arylene, arylene-hydroxyl and mixtures thereof; and, n = 1, 2 or 3, further where at least one of R_1, R_2, R_3, and R_4 is an arylene-hydroxy group.

~~7.~~ 9. The composition of claim ~~2 or 6~~ 8, where R_4 comprises an arylene-hydroxy group ~~or is an arylene-hydroxyl moiety~~.

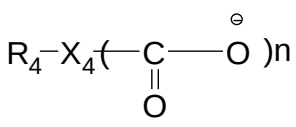
~~8.~~ 10. The composition according to ~~one of~~ claim~~s~~ 1 ~~to 7~~, wherein the chromophore group is selected from a group consisting of a substituted phenyl group, unsubstituted phenyl group, substituted anthracyl group, unsubstituted anthracyl group, substituted phenanthryl group, unsubstituted phenanthryl group, substituted naphthyl group, unsubstituted naphthyl group, substituted heterocyclic aromatic rings containing heteroatoms selected from oxygen, nitrogen and sulfur, and unsubstituted heterocyclic aromatic rings containing heteroatoms selected from oxygen, nitrogen and sulfur, and a mixture thereof.

~~9.~~ 11. The composition according to ~~one of~~ claim~~s~~ 1 ~~to 8~~, wherein the hydroxyl and/or a carboxyl group is derived from a monomer selected from a group consisting of acrylic acid, methacrylic acid, vinyl alcohol, hydroxystyrenes, ~~copolymers of hydroxystyrene and~~ vinyl monomers containing 1,1,1,3,3,3-hexafluoro-2-propanol, and mixtures of these monomers.

12. The composition according to claim 1, wherein the chromophore group and the hydroxyl and/or a carbonxyl group are present in one monomeric unit.

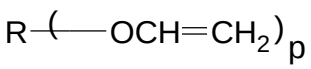
~~10.~~13.The composition according to ~~one of~~ claim~~s~~ 1 ~~to 9~~, wherein the chromophore group and the hydroxyl and/or a carboxyl group are present in ~~one monomeric unit~~ in differing monomeric units.

~~11.~~14. The composition according to ~~one of~~ claims 1 ~~to 10~~, where Y is structure 2,



(2)

where R_4 is selected from a group consisting of C_1-C_8 alkyl, aryl, C_1-C_8 alkylene, arylene, arylene-hydroxyl and mixtures thereof ~~and preferably comprises an arylene-hydroxyl moiety~~; X_4 is a direct valence bond or a C_1-C_8 alkylene group; n = 1, 2 or 3; and further where the crosslinking agent is represented by the structure below;



wherein, R is selected from a group consisting of a (C_1-C_{30}) linear alkyl, (C_1-C_{30}) branched alkyl, (C_1-C_{30}) of ~~or~~ cyclic alkyl, substituted ~~or unsubstituted~~ (C_6-C_{40}) aryl, unsubstituted (C_6-C_{40}) aryl, ~~and~~ substituted ~~or unsubstituted~~ (C_7-C_{40}) alicyclic hydrocarbon and unsubstituted (C_7-C_{40}) alicyclic hydrocarbon; and $p \geq 2$.

15. The composition according to claim 14, where R_4 comprises an arylene-hydroxyl moiety.

~~12.~~16. A process for forming a positive image comprising:

a) forming a coating of the bottom photoimageable antireflective coating composition of ~~one of~~ claim~~s~~ 1 ~~to 11~~ on a substrate;

b) baking the antireflective coating,

c) providing a coating of a top photoresist layer over the bottom coating;

d) imagewise exposing the photoresist and bottom coating layers to actinic radiation ~~of same wavelength~~;

e) post-exposure baking the photoresist and bottom coating layers on the substrate; and,

f) developing the photoresist and bottom coating layers with an aqueous alkaline solution, thereby forming a pattern in the photoresist and the antireflective coating film.

~~13.~~17. The process according to claim ~~12~~ 16, wherein the antireflective coating becomes insoluble in organic solvents and aqueous alkaline solution after the baking step prior to coating the photoresist layer and becomes soluble in aqueous

alkaline solution after exposure to actinic radiation prior to developing the photoresist and bottom antireflective coating layer.

~~14.~~18. A process for forming a positive image comprising:

a) forming a coating of the antireflective coating composition of ~~one of~~ claim~~s~~ 1 ~~to 11~~ on a substrate;

b) baking the antireflective coating,

c) providing a coating of a top photoresist layer over the bottom coating;

d) imagewise exposing the photoresist to actinic radiation ~~of same wavelength~~;

e) post-exposure baking the photoresist and bottom coating layers on the substrate; and,

f) developing the photoresist with an aqueous alkaline solution, thereby forming a photoresist pattern on the antireflective coating.