

tyl, neopentyl, cyclopentyl, hexyl, heptyl, 2-ethylhexyl, nonyl, undecyl, tridecyl, pentadecyl, heptadecyl, and icosanyl; monovalent saturated alicyclic hydrocarbon groups such as cyclohexyl, 1-adamantyl, 2-adamantyl, 1-adamantylmethyl, norbornyl, norbornylmethyl, tricyclodecanyl, tetracyclododecanyl, tetracyclododecanylmethyl, and dicyclohexylmethyl; monovalent unsaturated aliphatic hydrocarbon groups such as allyl and 3-cyclohexenyl; and aralkyl groups such as benzyl and diphenylmethyl. Suitable heteroatom-containing monovalent hydrocarbon groups include tetrahydrofuryl, methoxymethyl, ethoxymethyl, methylthiomethyl, acetamidomethyl, trifluoroethyl, (2-methoxyethoxy)methyl, acetoxymethyl, 2-carboxy-1-cyclohexyl, 2-oxopropyl, 4-oxo-1-adamantyl, and 3-oxocyclohexyl. In the foregoing groups, one or more hydrogen atoms may be substituted by a substituent containing a heteroatom such as oxygen, sulfur, nitrogen or halogen, or one or more carbon atoms may be substituted by a substituent containing a heteroatom such as oxygen, sulfur or nitrogen, so that the group may contain a hydroxyl radical, cyano radical, carbonyl radical, ether bond, ester bond, sulfonic acid ester bond, carbonate bond, lactone ring, sultone ring, carboxylic anhydride or haloalkyl radical.

[0058] In formula (1B), R^{fb1} and R^{fb2} are each independently fluorine or a C_1 - C_{40} monovalent hydrocarbon group which may contain a heteroatom. The monovalent hydrocarbon group may be straight, branched or cyclic, and examples thereof are as exemplified above for R^e . R^{fb1} and R^{fb2} are preferably fluorine or a C_1 - C_4 straight fluoroalkyl group. R^{fb1} and R^{fb2} may bond together to form a ring with the linkage ($-\text{CF}_2-\text{SO}_2-\text{N}^--\text{SO}_2-\text{CF}_2-$) to which they are attached, and preferably a combination of R^{fb1} and R^{fb2} is fluoroethylene or fluoropropylene.

[0059] In formula (1C), R^{fc1} , R^{fc2} and R^{fc3} are each independently fluorine or a C_1 - C_{40} monovalent hydrocarbon group which may contain a heteroatom. The monovalent hydrocarbon group may be straight, branched or cyclic, and examples thereof are as exemplified above for R^e . Preferably R^{fc1} , R^{fc2} and R^{fc3} are fluorine or C_1 - C_4 straight fluoroalkyl groups. R^{fc1} and R^{fc2} may bond together to form a ring with the linkage ($-\text{CF}_2-\text{SO}_2-\text{C}-\text{SO}_2-\text{CF}_2-$) to which they are attached, and preferably a combination of R^{fc1} and R^{fc2} is fluoroethylene or fluoropropylene.

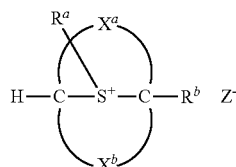
[0060] In formula (1D), R^{fd} is a C_1 - C_{40} monovalent hydrocarbon group which may contain a heteroatom. The monovalent hydrocarbon group may be straight, branched or cyclic, and examples thereof are as exemplified above for R .

[0061] The compound having the anion of formula (1D) has a sufficient acid strength to cleave acid labile groups in the resist polymer because it is free of fluorine at α -position of sulfo group, but has two trifluoromethyl groups at β -position. Thus the compound is a useful PAG.

[0062] Of the compounds having formula (1a), those compounds having the following formula (1b) are preferred.

[0063] In formula (1b), X^a , X^b , R^a , R^b , and Z^- are as defined above. R^b is preferably hydrogen.

[0064] For the compound having formula (1a), exemplary structures excluding R^a are given below, but not limited thereto. Herein R^a is as defined above.



(1b)

