CLAIMS

1. A method for cleaning a semiconductor substrate, the method comprising a step of swelling, peeling and dissolving an adhesive layer formed on a semiconductor substrate using a peeling and dissolving composition,

wherein the peeling and dissolving composition contains:

a component [I]: a quaternary ammonium salt;

a component [II]: an amide-based solvent;

a component [III]: a solvent represented by the following Formula (L); and

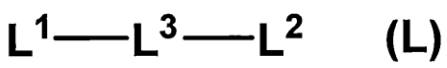
a component [IV]: a solvent represented by the following Formula (T) or the following Formula (G):

the quaternary ammonium salt is a halogen-containing quaternary ammonium salt,

the amide-based solvent is an acid amide derivative represented by the following Formula (Z) or a compound represented by the following Formula (Y),

the content of the amide-based solvent of the component [II] in the peeling and dissolving composition is 20 to 50 mass% with respect to 100 mass% of an aprotic solvent:

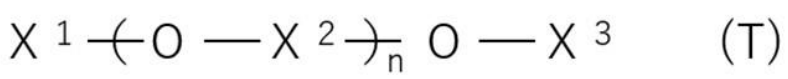
[Chem. 1]



(L)

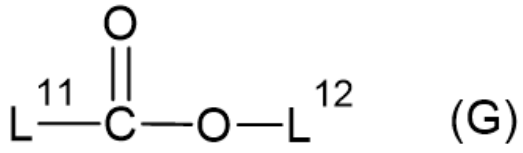
in the formula, $L^1$ and $L^2$ each independently represent an alkyl group having 2 to 5 carbon atoms, and $L^3$ represents O or S,

[Chem. 2]



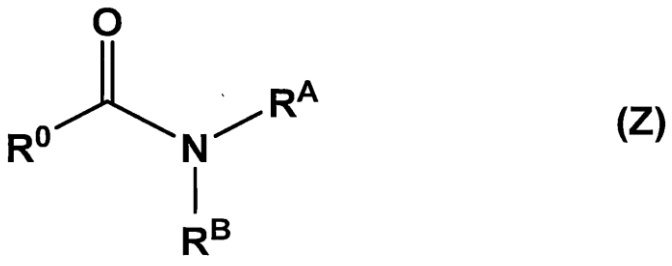
in the formula, $X^1$ and $X^3$ each independently represent an alkyl group or an acyl group ($X^4$-C(=O)-), $X^2$ represents an alkylene group, n represents 2 or 3, and $X^4$ represents an alkyl group,

[Chem. 3]



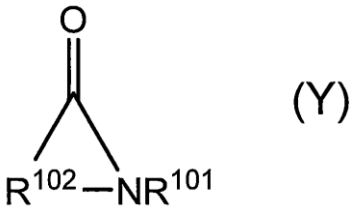
in the formula, $L^{11}$ and $L^{12}$ each independently represent an alkyl group having 1 to 6 carbon atoms, and a total number of carbon atoms in the alkyl group of $L^{11}$ and carbon atoms in the alkyl group of $L^{12}$ is 7 or less,

[Chem. 4]



in the formula, $R^0$ represents an ethyl group, a propyl group, or an isopropyl group, and $R^A$ and $R^B$ each independently represent an alkyl group having 1 to 4 carbon atoms,

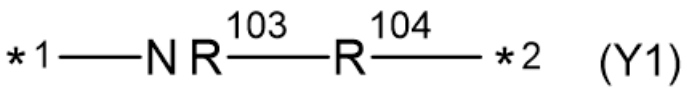
[Chem. 5]



(Y)

in the formula, $R^{101}$ represents a hydrogen atom or an alkyl group having 1 to 6 carbon atoms, and $R^{102}$ represents an alkylene group having 1 to 6 carbon atoms or a group represented by the following Formula (Y1),

[Chem. 6]



(Y1)

in the formula, $R^{103}$ represents a hydrogen atom or an alkyl group having 1 to 6 carbon atoms, $R^{104}$ represents an alkylene group having 1 to 5 carbon atoms, *1 represents a bond bonded to a carbon atom in Formula (Y), and *2 represents a bond bonded to a nitrogen atom in Formula (Y).

2. The method for cleaning a semiconductor substrate according to claim 1, wherein $L^1$ and $L^2$ are the same groups.

3. The method for cleaning a semiconductor substrate according to claim 1, wherein the adhesive layer is a film obtained using an adhesive composition containing an adhesive component (S) containing at least one selected from a siloxane-based adhesive, an acrylic resin-based adhesive, an epoxy resin-based adhesive, a polyamide-based adhesive, a polystyrene-based adhesive, a polyimide adhesive, and a phenolic resin-based adhesive.

4. The method for cleaning a semiconductor substrate according to claim 3, wherein the adhesive component (S) contains a siloxane-based adhesive.

5. The method for cleaning a semiconductor substrate according to claim 4, wherein the siloxane-based adhesive contains a polyorganosiloxane component (A') which is cured by a hydrosilylation reaction.

6. The method for cleaning a semiconductor substrate according to claim 1, wherein the peeling and dissolving step includes a step of eliminating the peeled adhesive layer.

7. The method for cleaning a semiconductor substrate according to claim 1, wherein the content of the solvent represented by formula (L) of the component [III] in the peeling and dissolving composition is 30 mass% or more with respect to 100 mass% of the aprotic solvent.

8. The method for cleaning a semiconductor substrate according to claim 7, wherein the total content of the solvent represented by formula (L) as the component [III] and the solvent represented by formula (T) or formula (G) as the component [IV] in the peeling and dissolving composition is 40 to 90 mass% with respect to 100 mass% of the aprotic solvent.

9. A method for manufacturing a processed semiconductor substrate, the method comprising:

a first step of manufacturing a laminate including a semiconductor substrate, a support substrate, and an adhesive layer obtained using an adhesive composition;

a second step of processing the semiconductor substrate of the obtained laminate;

a third step of separating the semiconductor substrate and the adhesive layer from the support substrate; and

a fourth step of swelling, peeling and dissolving the adhesive layer formed on the semiconductor substrate using a peeling and dissolving composition to remove the adhesive layer,

wherein the peeling and dissolving composition contains:

a component [I]: a quaternary ammonium salt;

a component [II]: an amide-based solvent;

a component [III]: a solvent represented by the

following Formula (L); and

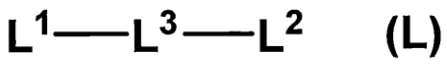
a component [IV]: a solvent represented by the following Formula (T) or the following Formula (G):

the quaternary ammonium salt is a halogen-containing quaternary ammonium salt,

the amide-based solvent is an acid amide derivative represented by the following Formula (Z) or a compound represented by the following Formula (Y),

the content of the amide-based solvent of the component [II] in the peeling and dissolving composition is 20 to 50 mass% with respect to 100 mass% of an aprotic solvent.

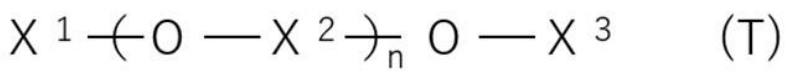
[Chem. 7]



$$L^1—L^3—L^2 \quad (L)$$

in the formula, $L^1$ and $L^2$ each independently represent an alkyl group having 2 to 5 carbon atoms, and $L^3$ represents O or S,

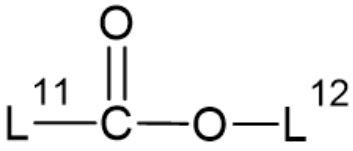
[Chem. 8]



$$X^1—(O—X^2)_n—O—X^3 \quad (T)$$

in the formula, $X^1$ and $X^3$ each independently represent an alkyl group or an acyl group ($X^4$-C(=O)-), $X^2$ represents an alkylene group, n represents 2 or 3, and $X^4$ represents an alkyl group,

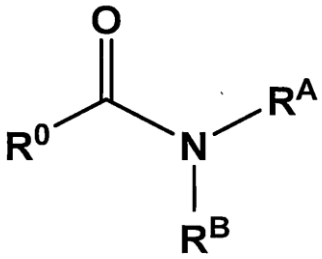
[Chem. 9]



(G)

in the formula, $L^{11}$ and $L^{12}$ each independently represent an alkyl group having 1 to 6 carbon atoms, and a total number of carbon atoms in the alkyl group of $L^{11}$ and carbon atoms in the alkyl group of $L^{12}$ is 7 or less,

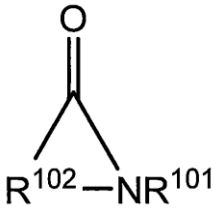
[Chem. 10]



(Z)

in the formula, $R^0$ represents an ethyl group, a propyl group, or an isopropyl group, and $R^A$ and $R^B$ each independently represent an alkyl group having 1 to 4 carbon atoms,

[Chem. 11]

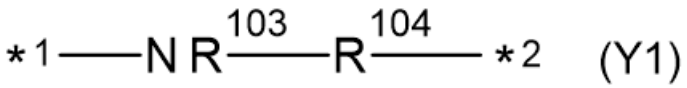


(Y)

in the formula, $R^{101}$ represents a hydrogen atom or an alkyl group having 1 to 6 carbon atoms, and $R^{102}$ represents

an alkylene group having 1 to 6 carbon atoms or a group represented by the following Formula (Y1),

[Chem. 12]



in the formula, $R^{103}$ represents a hydrogen atom or an alkyl group having 1 to 6 carbon atoms, $R^{104}$ represents an alkylene group having 1 to 5 carbon atoms, *1 represents a bond bonded to a carbon atom in Formula (Y), and *2 represents a bond bonded to a nitrogen atom in Formula (Y).

10. The method for manufacturing a processed semiconductor substrate according to claim 9, wherein $L^1$ and $L^2$ are the same groups.

11. The method for manufacturing a processed semiconductor substrate according to claim 9, wherein the adhesive layer is a film obtained using an adhesive composition containing an adhesive component (S) containing at least one selected from a siloxane-based adhesive, an acrylic resin-based adhesive, an epoxy resin-based adhesive, a polyamide-based adhesive, a polystyrene-based adhesive, a polyimide adhesive, and a phenolic resin-based adhesive.

12. The method for manufacturing a processed

semiconductor substrate according to claim 11, wherein the adhesive component (S) contains a siloxane-based adhesive.

13. The method for manufacturing a processed semiconductor substrate according to claim 12, wherein the siloxane-based adhesive contains a polyorganosiloxane component (A') which is cured by a hydrosilylation reaction.

14. The method for manufacturing a processed semiconductor substrate according to claim 9, wherein the fourth step of peeling and dissolving the adhesive layer to remove the adhesive layer includes a step of eliminating the peeled adhesive layer.

15. The method for manufacturing a processed semiconductor substrate according to claim 9, wherein the content of the solvent represented by formula (L) of the component [III] in the peeling and dissolving composition is 30 mass% or more with respect to 100 mass% of the aprotic solvent.

16. The method for manufacturing a processed semiconductor substrate according to claim 15, wherein the total content of the solvent represented by formula (L) as the component [III] and the solvent represented by formula (T) or formula (G) as the component [IV] in the peeling and dissolving composition is 40 to 90 mass% with respect to 100 mass% of the aprotic solvent.