## CLAIMS

1. An alkyl tin compound having an alkyl group bonded to a tin atom and a C2-8 alkoxy group bonded to the tin atom,

wherein the alkyl group is a C5-18 branched alkyl or cyclic group-substituted alkyl group,

the C5-C18 branched alkyl group being an alkyl group branched at at least one carbon atom of the first to third carbon atoms counting from the tin atom, and

the cyclic group-substituted alkyl group being an alkyl group having a cyclic group bonded at at least one carbon atom of the first to third carbon atoms counting from the tin atom.

2. The alkyl tin compound according to claim 1, which is an alkyl tin compound having one to three branched alkyl groups bonded to one tin atom,

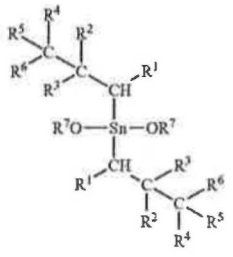
the valency of the tin atom being tetravalent.

3. The alkyl tin compound according to claim 2, wherein a C2-8 alkoxy group is further bonded to the tin atom.

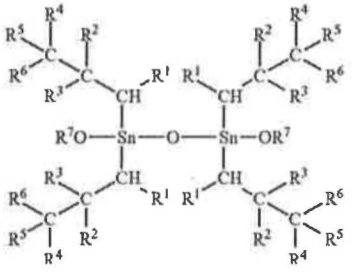
4. The alkyl tin compound according to claim 2, which is a dialkyl tin alkoxide or a tetraalkyldialkoxydistannoxane.

5. The alkyl tin compound according to claim 4, which is a compound represented by formula (1) or a compound represented by formula (2);

(1)



(2)



wherein (i) $R^1$, $R^2$, $R^3$, $R^4$, $R^5$ and $R^6$ each independently represent hydrogen or a C1-15 alkyl group, and $R^7$ represents a C2-8 alkyl group,

(ii-1) at least one of $R^1$, $R^2$ and $R^3$ is an alkyl group, or

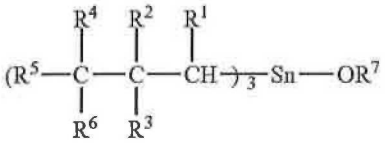
(ii-2) all of $R^1$, $R^2$ and $R^3$ are hydrogens, and at least two of $R^4$, $R^5$ and $R^6$ are alkyl groups, and

(iii) the total number of carbon atoms of $R^1$, $R^2$, $R^3$, $R^4$, $R^5$ and $R^6$ is 2-15.

6. The alkyl tin compound according to claim 2, which is a trialkyl tin compound.

7. The alkyl tin compound according to claim 6, which is a compound represented by formula (3);

(3)



wherein (i) $R^1$, $R^2$, $R^3$, $R^4$, $R^5$ and $R^6$ each independently represent hydrogen or a C1-15 alkyl group, and $R^7$ represents a C2-8 alkyl group,

(ii-1) at least one of $R^1$, $R^2$ and $R^3$ is an alkyl group, or

(ii-2) all of $R^1$, $R^2$ and $R^3$ are hydrogens, and at least two of $R^4$, $R^5$ and $R^6$ are alkyl groups, and

(iii) the total number of carbon atoms of $R^1$, $R^2$, $R^3$, $R^4$, $R^5$ and $R^6$ is 2-15.

8. The alkyl tin compound according to claim 3, wherein the alkoxy group is an alkoxy group selected from among n-butyloxy, isobutyloxy, sec-butyloxy and C5-8 alkoxy groups.

9. The alkyl tin compound according to claim 3, wherein the alkoxy group is a branched alkoxy group.

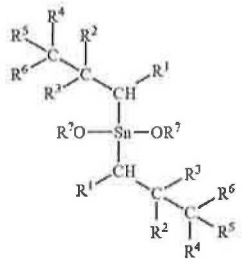
10. The alkyl tin compound according to claim 3, which is an alkyl tin alkoxide obtained from an alkyl tin carboxylate, alkyl tin oxide, alkyl tin oxide polymer or alkyl tin halide.

11. The alkyl tin compound according to claim 2,

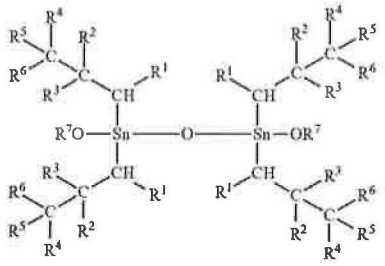
which is an alkyl tin alkoxide having a C5-18 branched alkyl group and a C4-8 branched alkoxy group, and

which is a compound represented by formula (1) or a compound represented by formula (2);

(1)



(2)



wherein (i) $R^1$, $R^2$, $R^3$, $R^4$, $R^5$ and $R^6$ each independently represent hydrogen or a C1-15 alkyl group, and $R^7$ represents a C4-8 branched alkyl group,

(ii-1) at least one of $R^1$, $R^2$ and $R^3$ is an alkyl group, or

(ii-2) all of $R^1$, $R^2$ and $R^3$ are hydrogens, and at least two of $R^4$, $R^5$ and $R^6$ are alkyl groups, and

(iii) the total number of carbon atoms of $R^1$, $R^2$, $R^3$, $R^4$, $R^5$ and $R^6$ is 2-15.

12. The alkyl tin compound according to claim 1,

which is an alkyl tin compound having a cyclic group-substituted alkyl group bonded to a tin atom,

the cyclic group-substituted alkyl group being an alkyl group having a cyclic group selected from among alicyclic hydrocarbon groups and aromatic hydrocarbon groups bonded to at least one carbon atom among the first to third carbon atoms counting from the tin atom, and

the valency of the tin atom being tetravalent.

13. The alkyl tin compound according to claim 12, wherein

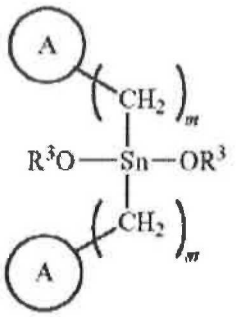
the alkyl tin compound further has a C2-8 alkoxy group, and

the cyclic group is a C4-18 cyclic group.

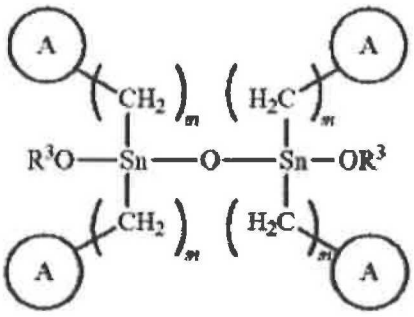
14. The alkyl tin compound according to claim 12, which is a di(cyclic group-substituted alkyl) tin dialkoxide or a tetra(cyclic group-substituted alkyl)dialkoxydistannoxane.

15. The alkyl tin compound according to claim 14, which is a compound represented by the following formula (1) or a compound represented by formula (2);

(1)



(2)

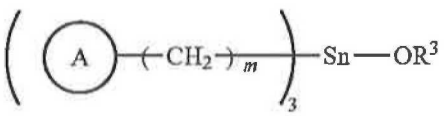


wherein ring A represents a C3-16 alicyclic hydrocarbon group or a C6-16 aromatic hydrocarbon group, m is an integer of 1 to 3, and $R^3$ represents a C2-8 alkyl group.

16. The alkyl tin compound according to claim 12, which is a tri(cyclic group-substituted alkyl) tin compound.

17. The alkyl tin compound according to claim 16, which is a compound represented by formula (3);

(3)



wherein ring A represents a C3-16 alicyclic hydrocarbon group or a C6-16 aromatic hydrocarbon group, m is an integer of 1 to 3, and $R^3$ represents a C2-8 alkyl group.

18. The alkyl tin compound according to claim 13, wherein the alkoxy group is a C4-8 alkoxy group, and the alcohol corresponding to the alkoxy group is an alcohol having a boiling point of 100°C. or higher at ordinary pressure.

19. The alkyl tin compound according to claim 18, wherein the alcohol forms an azeotropic mixture with water.

20. The alkyl tin compound according to claim 13, wherein the alkoxy group is a branched alkoxy group.

21. The alkyl tin compound according to claim 13, which is an alkyl tin alkoxide obtained from a cyclic group-substituted alkyl tin carboxylate, a cyclic group-substituted alkyl tin oxide, a cyclic group-substituted alkyl tin oxide polymer or a halogenated (cyclic group-substituted alkyl) tin compound.

22. A composition comprising an alkyl tin compound according to claim 1.

23. The composition according to claim 22, wherein the alkyl tin compound comprises:

a dialkyl tin alkoxide and a trialkyl tin compound;

a tetraalkyldialkoxydistannoxane and a trialkyl tin compound;

a di(cyclic group-substituted alkyl) tin dialkoxide and a tri(cyclic group-substituted alkyl) tin compound; or

a tetra(cyclic group-substituted alkyl)dialkoxydistannoxane and a tri(cyclic group-substituted alkyl) tin compound.

24. A catalyst for a process for producing a carbonic acid ester from carbon dioxide and an alcohol,

the catalyst comprising an alkyl tin compound according to claim 1.

25. A method for producing a carbonic acid ester using an alkyl tin compound according to claim 1, the method comprising steps (1) to (3);

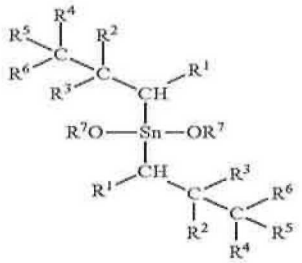
Step (1): A step of reacting the alkyl tin compound with carbon dioxide to obtain a reaction mixture containing a carbonic acid ester;

Step (2): A step of separating the carbonic acid ester from the reaction mixture to obtain a residual solution;

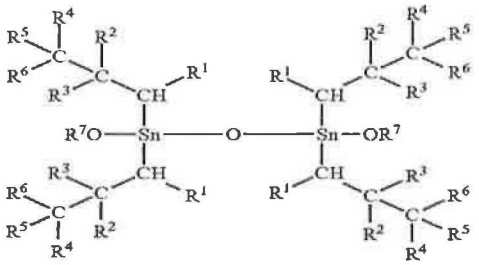
Step (3): A step of reacting the residual solution with an alcohol and removing the water produced by the reaction, to obtain an alkyl tin alkoxide, and recycling it to step (1).

26. The method according to claim 25, wherein the alkyl tin compound includes either or both a compound represented by formula (1) and/or a compound represented by formula (2);

(1)



(2)



wherein (i) $R^1$, $R^2$, $R^3$, $R^4$, $R^5$ and $R^6$ each independently represent hydrogen or a C1-15 alkyl group, and $R^7$ represents a C2-8 alkyl group,

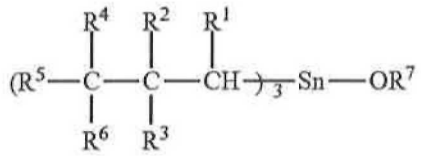
(ii-1) at least one of $R^1$, $R^2$ and $R^3$ is an alkyl group, or

(ii-2) all of $R^1$, $R^2$ and $R^3$ are hydrogens, and at least two of $R^4$, $R^5$ and $R^6$ are alkyl groups, and

(iii) the total number of carbon atoms of $R^1$, $R^2$, $R^3$, $R^4$, $R^5$ and $R^6$ is 2-15.

27. The method according to claim 26, wherein the alkyl tin compound further includes a compound represented by formula (3);

(3)



wherein (i) $R^1$, $R^2$, $R^3$, $R^4$, $R^5$ and $R^6$ each independently represent hydrogen or a C1-15 alkyl group, and $R^7$ represents a C2-8 alkyl group,

(ii-1) at least one of $R^1$, $R^2$ and $R^3$ is an alkyl group, or

(ii-2) all of $R^1$, $R^2$ and $R^3$ are hydrogens, and at least two of $R^4$, $R^5$ and $R^6$ are alkyl groups, and

(iii) the total number of carbon atoms of $R^1$, $R^2$, $R^3$, $R^4$, $R^5$ and $R^6$ is 2-15.

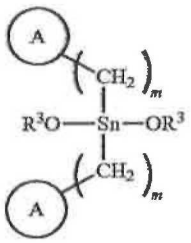
28. The method according to claim 26, wherein the alkoxy group of the alkyl tin compound is selected from among n-butyloxy, isobutyloxy, sec-butyloxy and C5-8 alkoxy groups.

29. The method according to claim 26, wherein the alcohol is an alcohol selected from among n-butyl alcohol, isobutyl alcohol, sec-butyl alcohol and C5-8 alkyl alcohols.

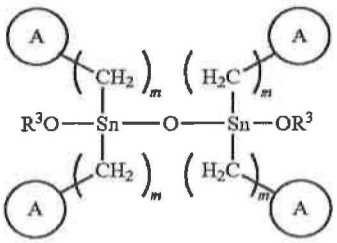
30. The method according to claim 26, wherein
the alkoxy group of the alkyl tin compound is a branched alkoxy group, and
the alcohol is the branched alcohol corresponding to the branched alkoxy group.

31. The method according to claim 25, wherein the alkyl tin compound includes either or both a compound represented by formula (1) and/or a compound represented by formula (2);

(1)



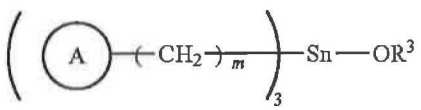
(2)



wherein ring A represents a C3-16 alicyclic hydrocarbon group or a C6-16 aromatic hydrocarbon group, m is an integer of 1 to 3, and $R^3$ represents a C2-8 alkyl group.

32. The method according to claim 31, wherein the alkyl tin compound further includes a compound represented by formula (3);

(3)



wherein ring A represents a C3-16 alicyclic hydrocarbon group or a C6-16 aromatic hydrocarbon group, m is an integer of 1 to 3, and $R^3$ represents a C2-8 alkyl group.

33. The method according to claim 31, wherein

the alkoxy groups of the compound represented by formula (1) and the compound represented by formula (2) are C4-8 alkoxy groups,

the alcohols corresponding to the alkoxy groups are alcohols with boiling points of 100°C. or higher at ordinary pressure, and

the alcohol used in step (3) is the alcohol corresponding to the alkoxy group.

34. The method according to claim 31, wherein the alcohol is a C4-8 alcohol with a boiling point of 100°C. or higher at ordinary pressure.

35. The method according to claim 31, wherein the alcohol is an alcohol selected from among n-butyl alcohol, isobutyl alcohol, sec-butyl alcohol and C5-8 alkyl alcohols.

36. The method according to claim 31, wherein

the alkoxy group of the alkyl tin compound is a branched alkoxy group, and

the alcohol is a branched alcohol.