CLAIMS

I (We) claim:

1. A process for producing an isocyanate, comprising the steps of:

obtaining a reaction mixture containing an aryl carbamate having an aryl group originating from a diaryl carbonate, an aromatic hydroxy compound originating from a diaryl carbonate, and a diaryl carbonate, by reacting the diaryl carbonate and an amine compound in a reaction vessel in which a reaction between the diaryl carbonate and the amine compound is carried out;

transferring the reaction mixture to a thermal decomposition reaction vessel connected by a line with the reaction vessel in which the reaction between the diaryl carbonate and the amine compound is carried out; and

obtaining the isocyanate by applying the aryl carbamate to a thermal decomposition reaction,

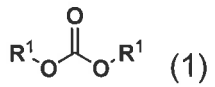
wherein the amine compound is a polyamine compound, and

the diaryl carbonate comprise a metal atom at from 0.001 ppm to 10%.

2. The process according to Claim 1, further comprising cleaning a high boiling point by-product adhered to the thermal decomposition reaction vessel, with an acid.

3. The process according to Claim 1, wherein the reaction between the diaryl carbonate and the amine compound is carried out at a stoichiometric ratio of the diaryl carbonate to amino groups constituting the amine compound being 1 or more.

4. The process according to Claim 1, wherein the diaryl carbonate and the amine compound are reacted in the presence of an aromatic hydroxy compound as a reaction solvent.



(1)

(wherein R^1 represents an aromatic group having 6 to 12 carbon atoms).

~~22. The process according to Claim 21, wherein the diaryl carbonate compriese a metal atom at from 0.001 ppm to 10%.~~

~~23~~22. The process according to Claim ~~22~~1, wherein the metal atom is one kind or a plurality of kinds of the metal atoms selected from the group consisting of iron, nickel, cobalt, zinc, tin, copper and titanium atoms.

~~24~~23. The process according to Claim 1, wherein the diaryl carbonate is a diaryl carbonate produced by a process which comprises the following steps (1) to (3):

step (1): obtaining a reaction mixture containing a dialkyl carbonate by reacting an organic tin compound having a tin-oxygen-carbon bond and carbon dioxide;

step (2): obtaining the dialkyl carbonate and a residue liquid by separating the reaction mixture; and

step (3): obtaining the diaryl carbonate by reacting the dialkyl carbonate separated in step (2) and an aromatic hydroxy compound A followed by recovering a by-product alcohol.

~~25~~24. The process according to Claim ~~24~~23, wherein the aromatic hydroxy compound A is an aromatic hydroxy compound having 6 to 12 carbon atoms.

~~26~~25. The process according to Claim ~~24~~23, wherein the diaryl carbonate is a diaryl carbonate produced by a process which further comprises the following steps

(4) and (5):

step (4): forming an organic tin compound having a tin-oxygen-carbon bond and water by reacting the residue liquid obtained in step (2) with an alcohol followed by removing the water from a reaction system; and

step (5): reusing the organic tin compound having the tin-oxygen-carbon bond obtained in step (4) as the organic tin compound having a tin-oxygen-carbon bond of step (1).

~~27~~26. The process according to Claim ~~24~~25, wherein the alcohol recovered in step (3) is used as all or a portion of the alcohol of the step (4).

~~28~~27. The process according to Claim 9, wherein the diaryl carbonate is separated and recovered from the liquid phase component or gaseous phase component recovered from the thermal decomposition reaction vessel, and the diaryl carbonate is reused as a diaryl carbonate used as a starting material.

~~29~~28. The process according to Claim ~~1 or 24~~23, wherein an aromatic hydroxy compound is separated and recovered from the liquid phase component or gaseous phase component recovered from the thermal decomposition reaction, and the aromatic hydroxy compound is recycled for use as the aromatic hydroxy compound A of the step (3) or as the aromatic hydroxy compound used as the reaction solvent.

~~30. The process according to Claim 1, wherein the amine compound is a polyamine compound.~~

~~31~~29. The process according to Claim ~~30~~1, wherein the amine compound is a

compound represented by the following formula (2):

$$R^2\text{-}\left(NH_2\right)_n \quad (2)$$

(wherein R^2 represents a group selected from the group consisting of an aliphatic group having 1 to 20 carbon atoms and an aromatic group having 6 to 20 carbon atoms, the above group containing an atom selected from a carbon atom and an oxygen atom, and having a valence equal to n, and

n represents an integer of from 2 to 10).

~~32~~30. The process according to Claim ~~31~~29, wherein the amine compound is a diamine compound in which n is 2 in the formula (2).

~~33~~31. The process according to Claim 1, wherein the supply of the amine compound to the reaction vessel in which a carbonic acid ester and the amine compound are reacted is carried out in a liquid state.

~~34~~32. The process according to Claim 1, wherein the supply of the amine compound to the reaction vessel in which a carbonic acid ester and the amine compound are reacted is carried out in a form of a mixture comprising an alcohol, a water or the carbonic acid ester.