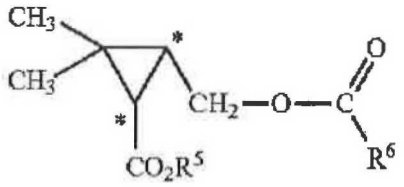
CLAIMS

1.A process for producing an optically active cyclopropanecarboxylic acid ester compound represented by the formula (4):

(4)

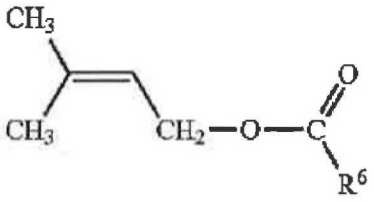


(wherein R^5, R^6 and * each represents the same meaning as defined below), comprising reacting a diazoacetic acid ester represented by the formula (2):

$N_2CHCO_2R^5$ (2)

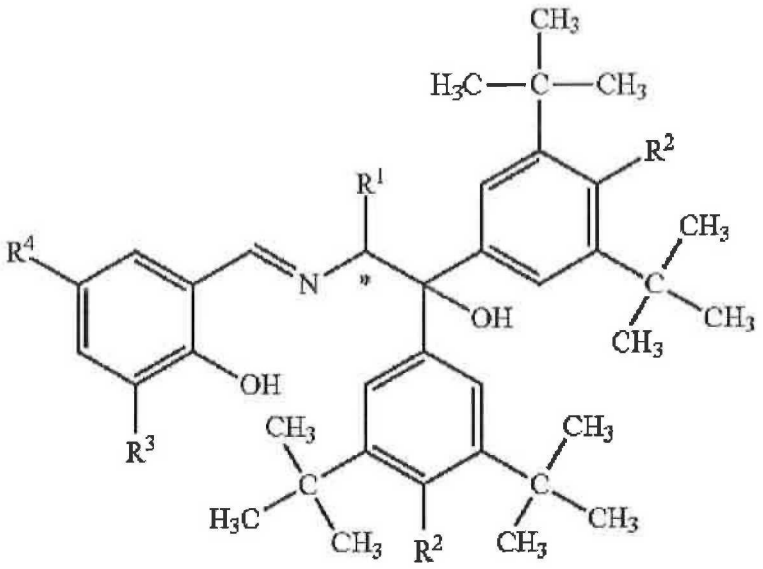
(wherein R^5 represents an alkyl group having 1 to 15 carbon atoms or an aryl group having 6 to 10 carbon atoms) with a compound represented by the formula (3):

(3)



(wherein R^6 represents an alkyl group having 1 to 15 carbon atoms, an aryl group having 6 to 10 carbon atoms or an aralkyl group having 7 to 20 carbon atoms), in the presence of an asymmetric copper complex obtained by reacting a copper compound and an optically active salicylideneaminoalcohol compound represented by the formula (1):

(1)



(wherein R^1 represents an alkyl group having 2 to 4 carbon atoms, an aryl group having 6 to 10 carbon atoms or an aralkyl group having 7 to 20 carbon atoms, R^2 represents a hydrogen atom, an alkyl group having 1 to 4 carbon atoms or an alkoxy group having 1 to 10 carbon atoms, R^3 represents a hydrogen atom, a nitro group or a bromine atom, R^4 represents a hydrogen atom or a nitro group, and * represents an asymmetric center);

wherein the optically active cyclopropanecarboxylic acid ester compound has a cis form ratio (ratio (%) of a cis form relative to a total of a cis form and a trans form) of 85% or more.

2.The production process according to claim 1, wherein the copper compound is a divalent copper compound.

3.The production process according to claim 1, wherein the copper compound is copper acetate.

4.The production process according to claim 1, wherein R^4 is a nitro group.

5.The production process according to claim 1, wherein R^2 is a hydrogen atom.

6.The production process according to claim 1, wherein R^5 is an ethyl group, and R^6 is a methyl group.

7.The production process according to claim 1, wherein the reaction of the diazoacetic acid ester represented by the formula (2) with the compound represented by the formula (3) is performed in the presence of a Lewis acid.

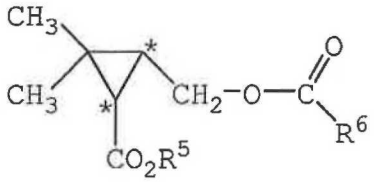
8.The production process according to claim 7, wherein the Lewis acid is a metal alkoxide having Lewis acidity.

9.The production process according to claim 1, wherein the reaction of the diazoacetic acid ester represented by the formula (2) with the compound represented by the formula (3) is performed in the presence of a lithium compound.

10. The production process according to claim 9, wherein the lithium compound is a lithium alkoxide having 1 to 4 carbon atoms.

11. The production process according to claim 1, wherein R^1 is $-CH(CH_3)_2$, $-CH_2CH_3$, $-CH_2CH(CH_3)_2$, a benzyl group, or $-CH(CH_3)CH_2CH_3$.

1. A process for producing an optically active cyclopropanecarboxylic acid ester compound represented by the formula (4):

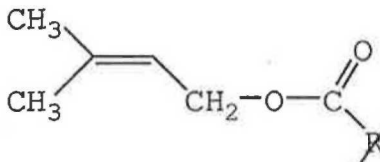


(4)

(wherein R^5, R^6 and * each represents the same meaning as defined below), comprising reacting a diazoacetic acid ester represented by the formula (2):

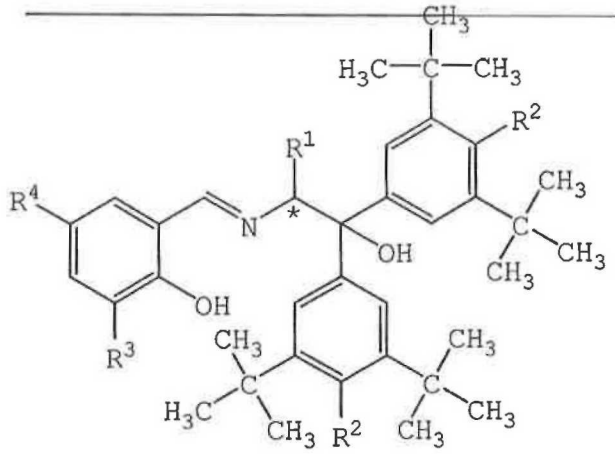
$N_2CHCO_2R^5$ (2)

(wherein R^5 represents an alkyl group having 1 to 15 carbon atoms or an aryl group having 6 to 10 carbon atoms) with a compound represented by the formula (3):



(3)

(wherein R^6 represents an alkyl group having 1 to 15 carbon atoms, an aryl group having 6 to 10 carbon atoms or an aralkyl group having 7 to 20 carbon atoms), in the presence of an asymmetric copper complex obtained by reacting a copper compound and an optically active salicylideneaminoalcohol compound represented by the formula (1):



(1)

(wherein R^1 represents an alkyl group having 1 to 4 carbon atoms, an aryl group having 6 to 10 carbon atoms or an aralkyl group having 7 to 20 carbon atoms, R^2 represents a hydrogen atom, an alkyl group having 1 to 4 carbon atoms or an alkoxy group having 1 to 10 carbon atoms, R^3 and R^4 independently represent a hydrogen atom or an electron withdrawing group, and * represents an asymmetric center).

2. The production process according to claim 1, wherein the copper compound is a divalent copper compound.

3. The production process according to claim 1, wherein the copper compound is copper acetate.

4. The production process according to claim 1, wherein R^4 is a nitro group.

5. The production process according to claim 1, wherein R^2 is a hydrogen atom.

6. The production process according to claim 1, wherein R^5 is an ethyl group, and R^6 is a methyl group.

7. The production process according to claim 1, wherein the reaction of the diazoacetic acid ester represented by the formula (2) with the compound represented by the formula (3) is performed in the presence of a Lewis acid.

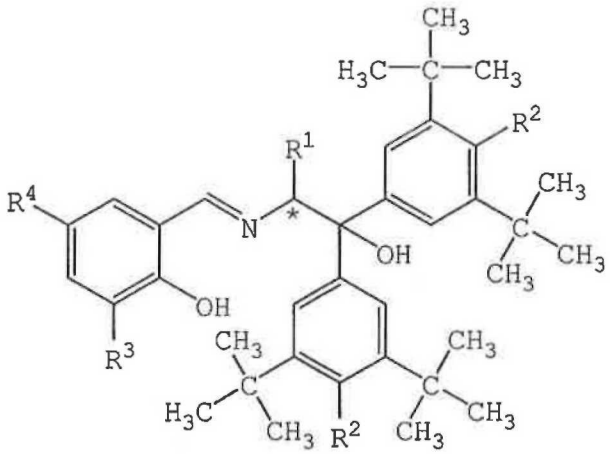
8. The production process according to claim 7, wherein the Lewis acid is a metal alkoxide having Lewis acidity.

9. The production process according to claim 1, wherein the reaction of the diazoacetic acid ester represented by the formula (2) with the compound represented by the formula (3) is performed in the presence of a lithium compound.

10. The production process according to claim 9, wherein the lithium compound is a lithium alkoxide having 1 to 4 carbon atoms.

11. An asymmetric copper compound obtained by reacting a copper compound and an optically active

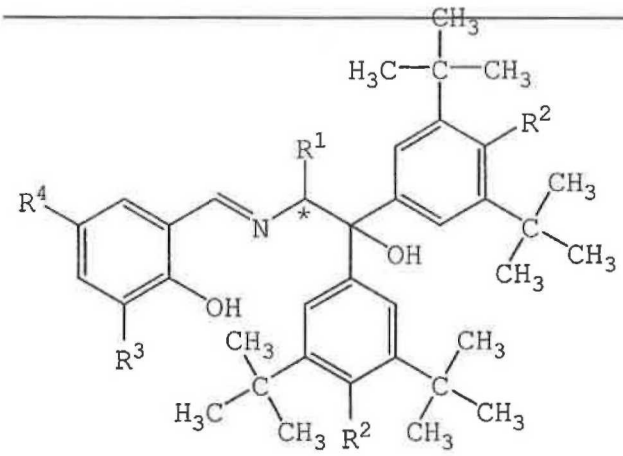
~~salicylideneaminoalcohol compound represented by the formula~~ (1):



(1)

(wherein R^1 is an alkyl group having 2 to 4 carbon atoms, an aryl group having 6 to 10 carbon atoms or an aralkyl group having 7 to 20 carbon atoms, R^2 is a hydrogen atom, an alkyl group having 1 to 4 carbon atoms or an alkoxy group having 1 to 10 carbon atoms, R^3 and R^4 independently represent a hydrogen atom or an electron withdrawing group, and * represents an asymmetric center).

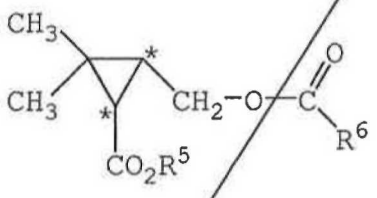
12. An optically active salicylideneaminoalcohol compound represented by the formula (1):



(1)

(wherein R^1 is an alkyl group having 2 to 4 carbon atoms, an aryl group having 6 to 10 carbon atoms, or an aralkyl group having 7 to 20 carbon atoms, R^2 is a hydrogen atom, an alkyl group having 1 to 4 carbon atoms or an alkoxy group having 1 to 10 carbon atoms, R^3 and R^4 independently represent a hydrogen atom or an electron withdrawing group, and * represents an asymmetric center).

13. A mixture of a cis form and a trans form of an optically active cyclopropanecarboxylic acid ester compound represented by the formula (4):



(4)

(wherein R^5 represents an alkyl group having 1 to 15 carbon atoms or an aryl group having 6 to 10 carbon atoms, R^6 represents an alkyl group having 1 to 15 carbon atoms, an aryl group having 6 to 10 carbon atoms or an aralkyl group having 7 to 20 carbon

atoms, and * represents an asymmetric center), wherein a ratio of the cis form relative to the total of the cis form and the trans form is 80% or more.

