CLAIMS

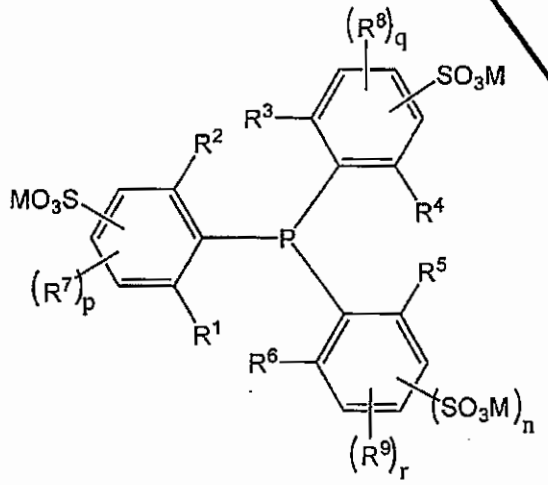
[Claim 1]

A method for producing 2,7-octadien-1-ol by subjecting butadiene and water to a telomerization in the presence of a palladium catalyst containing a water-soluble triarylphosphine having two or more sulfonate groups in the molecule and a palladium compound, a tertiary amine, and carbon dioxide, comprising a step of:

mixing the telomerization solution obtained by the telomerization with an organic solvent having a dielectric constant of 2 to 18 at 25°C, followed by carrying out phase separation in the presence of carbon dioxide, and then 2,7-octadien-1-ol is obtained from an organic phase while recovering an aqueous phase including the palladium catalyst.

[Claim 2]

The method for producing 2,7-octadien-1-ol according to claim 1, wherein the water-soluble triarylphosphine is represented by the following general formula (I):



(I)

wherein R^1, R^2, R^3, R^4, R^5, and R^6 each independently represent a hydrogen atom, an alkyl group having 1 to 4 carbon atoms, or an alkoxy group having 1 to 4 carbon atoms; R^7, R^8, and R^9 each independently represent an alkyl group having 1 to 4 carbon atoms or an alkoxy group having 1 to 4 carbon atoms; p, q, and r each independently represent an integer of 0 to 2; M's may be the same as or different from each other, and represent a cation of a metal atom belonging to Group 1 or an ammonium cation derived from a tertiary amine, in which the total number of carbon atoms of a group bonded to one atom of

nitrogen is 3 to 27; n represents 0 or 1; and the binding positions of sulfonate groups ($-SO_3M$) are all the meta-positions or the para-positions to phosphorous atoms.

[Claim 3]

The method for producing 2,7-octadien-1-ol according to claim 2, wherein in General Formula (I), R^1, R^3, R^5, R^7, R^8, and R^9 each independently represent a hydrogen atom, a methyl group, or a methoxy group, R^2, R^4, and R^6 are all hydrogen atoms, M's each independently represent a cation of an alkali metal atom or an ammonium cation derived from a tertiary amine, in which the total number of carbon atoms of a group bonded to one atom of nitrogen is 3 to 27, and the binding positions of sulfonate groups ($-SO_3M$) are all the meta-positions to phosphorous atoms.

[Claim 4]

The method for producing 2,7-octadien-1-ol according to claim 2, wherein in General Formula (I), R^1, R^2, R^3, R^4, R^5, and R^6 each independently represent a hydrogen atom, a methyl group, or a methoxy group, p, q, and r are all 0, M's each independently represent a cation of a lithium atom, a cation of a sodium atom, a cation of a potassium atom, or an ammonium cation derived from a tertiary amine, in which the total number of carbon atoms of a group bonded to one atom of nitrogen is 3 to 27, and the binding positions of sulfonate groups ($-SO_3M$) are each the diagonal positions of R^1, R^3, or R^5 on the benzene ring.

[Claim 5]

The method for producing 2,7-octadien-1-ol according to claim 4, wherein in General Formula (I), R^1, R^3, and R^5 are all the same as each other and represent a hydrogen atom or a methyl group, p, q, and r are all 0, and M's are the same as each other and represent a cation of a lithium atom, a cation of a sodium atom, a cation of a potassium atom, or an ammonium cation derived from a tertiary amine, in which the total number of carbon atoms of a group bonded to one atom of nitrogen is 3 to 27.

[Claim 6]

The method for producing 2,7-octadien-1-ol according to claim 1, wherein in General Formula (I), at least two of R^1, R^3, and R^5 are each an alkyl group having 1 to 4 carbon atoms or an alkoxy group having 1 to 4 carbon atoms.

[Claim 7]

The method for producing 2,7-octadien-1-ol according to claim 6, wherein

at least two of R^1, R^3, and R^5 are a methyl group.

[Claim 8]

The method for producing 2,7-octadien-1-ol according to any one of claims 1 to 7, wherein in General Formula (I), M is an ammonium cation derived from a tertiary amine, in which the total number of carbon atoms of a group bonded to one atom of nitrogen is 5 to 24.

[Claim 9]

The method for producing 2,7-octadien-1-ol according to claim 8, wherein M is an ammonium cation derived from a tertiary amine, in which the total number of carbon atoms of a group bonded to one atom of nitrogen is 5 to 7.

[Claim 10]

The method for producing 2,7-octadien-1-ol according to any one of claims 1 to 9, wherein the phase separation is carried out under the conditions of 130°C or lower and a total pressure after introduction of carbon dioxide of 0.1 MPa (gauge pressure) or more.

[Claim 11]

The method for producing 2,7-octadien-1-ol according to claim 10, wherein the phase separation is carried out at 5°C to 90°C, and a total pressure after introduction of carbon dioxide of 0.5 MPa to 3 MPa (gauge pressure).

[Claim 12]

The method for producing 2,7-octadien-1-ol according to any one of claims 1 to 11, wherein the telomerization is carried out under the conditions of 130°C or lower and a total pressure after introduction of carbon dioxide of 0.5 MPa (gauge pressure) or more.

[Claim 13]

The method for producing 2,7-octadien-1-ol according to any one of claims 1 to 12, wherein at least a part of the aqueous phase including the recovered palladium catalyst is reused in the telomerization.

CLAIMS

[Claim 1]

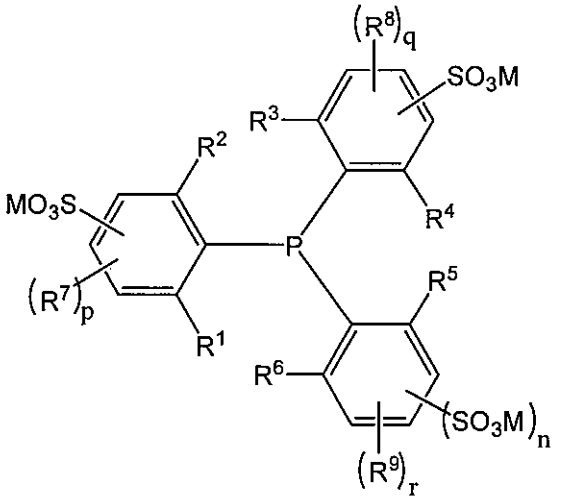
A method for producing 2,7-octadien-1-ol by subjecting butadiene and water to a telomerization in the presence of a palladium catalyst, a tertiary amine, and carbon dioxide,

wherein the palladium catalyst contains a water-soluble triarylphosphine having two or more sulfonate groups in the molecule and a palladium compound, comprising a step of:

mixing the telomerization solution obtained by the telomerization with an organic solvent having a dielectric constant of 2 to 18 at 25°C, followed by carrying out phase separation in the presence of carbon dioxide, and then 2,7-octadien-1-ol is obtained from an organic phase while recovering an aqueous phase including the palladium catalyst.

[Claim 2]

The method for producing 2,7-octadien-1-ol according to claim 1, wherein the water-soluble triarylphosphine is represented by the following general formula (I):



(I)

wherein R^1, R^2, R^3, R^4, R^5, and R^6 each independently represent a hydrogen atom, an alkyl group having 1 to 4 carbon atoms, or an alkoxy group having 1 to 4 carbon atoms; R^7, R^8, and R^9 each independently represent an alkyl group having 1 to 4 carbon atoms or an alkoxy group having 1 to 4 carbon atoms; p, q, and r each independently represent an integer of 0 to 2; M's may be the same as or different from each other, and represent a cation of a metal atom belonging to Group 1 or an ammonium cation derived from a tertiary amine, in

which the total number of carbon atoms of a group bonded to one atom of nitrogen is 3 to 27; n represents 0 or 1; and the binding positions of sulfonate groups (-SO_3M) are all the meta-positions or the para-positions to phosphorous atoms.

[Claim 3]

The method for producing 2,7-octadien-1-ol according to claim 2, wherein in General Formula (I), R^1, R^3, R^5, R^7, R^8, and R^9 each independently represent a hydrogen atom, a methyl group, or a methoxy group, R^2, R^4, and R^6 are all hydrogen atoms, M's each independently represent a cation of an alkali metal atom or an ammonium cation derived from a tertiary amine, in which the total number of carbon atoms of a group bonded to one atom of nitrogen is 3 to 27, and the binding positions of sulfonate groups (-SO_3M) are all the meta-positions to phosphorous atoms.

[Claim 4]

The method for producing 2,7-octadien-1-ol according to claim 2, wherein in General Formula (I), R^1, R^2, R^3, R^4, R^5, and R^6 each independently represent a hydrogen atom, a methyl group, or a methoxy group, p, q, and r are all 0, M's each independently represent a cation of a lithium atom, a cation of a sodium atom, a cation of a potassium atom, or an ammonium cation derived from a tertiary amine, in which the total number of carbon atoms of a group bonded to one atom of nitrogen is 3 to 27, and the binding positions of sulfonate groups (-SO_3M) are each the diagonal positions of R^1, R^3, or R^5 on the benzene ring.

[Claim 5]

The method for producing 2,7-octadien-1-ol according to claim 4, wherein in General Formula (I), R^1, R^3, and R^5 are all the same as each other and represent a hydrogen atom or a methyl group, p, q, and r are all 0, and M's are the same as each other and represent a cation of a lithium atom, a cation of a sodium atom, a cation of a potassium atom, or an ammonium cation derived from a tertiary amine, in which the total number of carbon atoms of a group bonded to one atom of nitrogen is 3 to 27.

[Claim 6]

The method for producing 2,7-octadien-1-ol according to claim 1, wherein in General Formula (I), at least two of R^1, R^3, and R^5 are each an alkyl group having 1 to 4 carbon atoms or an alkoxy group having 1 to 4 carbon atoms.

[Claim 7]

The method for producing 2,7-octadien-1-ol according to claim 6, wherein at least two of R^1, R^3, and R^5 are a methyl group.

[Claim 8]

The method for producing 2,7-octadien-1-ol according to any one of claims 1 to 7, wherein in General Formula (I), M is an ammonium cation derived from a tertiary amine, in which the total number of carbon atoms of a group bonded to one atom of nitrogen is 5 to 24.

[Claim 9]

The method for producing 2,7-octadien-1-ol according to claim 8, wherein M is an ammonium cation derived from a tertiary amine, in which the total number of carbon atoms of a group bonded to one atom of nitrogen is 5 to 7.

[Claim 10]

The method for producing 2,7-octadien-1-ol according to any one of claims 1 to 9, wherein the phase separation is carried out under the conditions of 130°C or lower and a total pressure after introduction of carbon dioxide of 0.1 MPa (gauge pressure) or more.

[Claim 11]

The method for producing 2,7-octadien-1-ol according to claim 10, wherein the phase separation is carried out at 5°C to 90°C, and a total pressure after introduction of carbon dioxide of 0.5 MPa to 3 MPa (gauge pressure).

[Claim 12]

The method for producing 2,7-octadien-1-ol according to any one of claims 1 to 11, wherein the telomerization is carried out under the conditions of 130°C or lower and a total pressure after introduction of carbon dioxide of 0.5 MPa (gauge pressure) or more.

[Claim 13]

The method for producing 2,7-octadien-1-ol according to any one of claims 1 to 12, wherein at least a part of the aqueous phase including the recovered palladium catalyst is reused in the telomerization.