Claims

[Claim 1]

A method for producing a polyester resin comprising a dicarboxylic acid unit and a diol unit, wherein at least a portion of the diol unit is a diol unit having a cyclic acetal skeleton, the method comprising the following steps (1) to (4-2):

step (1) of reacting any one or more compounds selected from the group consisting of a dicarboxylic acid (G), a polyester resin comprising a dicarboxylic acid (G) and a diol (B) having no cyclic acetal skeleton, and a dicarboxylic acid dialkyl ester (E), with a diol (B) having no cyclic acetal skeleton to obtain a dihydroxyester (F) represented by the following formula (1);

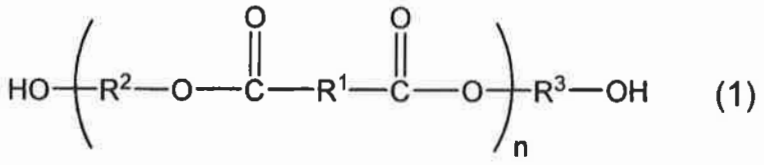
step (2) of subjecting the dihydroxyester (F) to transesterification reaction with a diol (A) having a cyclic acetal skeleton to obtain an oligomer;

step (3) of polymerizing the oligomer;

step (4-1) of distilling off a diol mixture (C) comprising the component (B) and/or the component (A) in the step (2) and/or the step (3), and decomposing the component (C) under a pH condition of 10 or lower such that a concentration of the component (A) in the component (C) is 0.5% by mass or lower; ~~and~~

step (4-2) of distilling the component (C) after the step (4-1) to obtain a purified diol (B1) comprising the component (B):

[Formula 1]



(1)

(wherein R^1, R^2, and R^3 each independently represent any divalent substituent selected from the group consisting of an aliphatic hydrocarbon group having 1 to 10 carbon atoms, an alicyclic hydrocarbon group having 3 to 10 carbon atoms, and an aromatic hydrocarbon group having 6 to 10 carbon atoms; and n is 1 or more and 200 or less~~.~~); and

step (5) of supplying the component (B1) to the step (1).

~~[Claim 2]~~

~~The method for producing the polyester resin according to claim 1, further comprising the following step (5):~~

~~step (5) of supplying the component (B1) to the step (1).~~

[Claim ~~3~~2]

The method for producing the polyester resin according to claim 1 ~~or 2~~, wherein the decomposition in the step (4-1) is a heat treatment.

[Claim ~~43~~]

The method for producing the polyester resin according to claim ~~32~~, wherein the heat treatment is performed under a condition where the component (C) is kept at 80 to 250°C for 1 to 20 hours.

[Claim ~~54~~]

The method for producing the polyester resin according to any one of claims 1 to ~~43~~, wherein R^2 and R^3 in the formula (1) each independently represent an aliphatic hydrocarbon group having 1 to 10 carbon atoms.

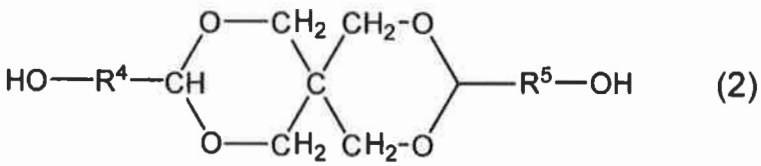
[Claim ~~65~~]

The method for producing the polyester resin according to any one of claims 1 to ~~54~~, wherein R^1 in the formula (1) is a group derived from any compound selected from the group consisting of terephthalic acid, isophthalic acid, and 2,6-naphthalenedicarboxylic acid.

[Claim ~~76~~]

The method for producing the polyester resin according to any one of claims 1 to ~~65~~, wherein the diol unit having a cyclic acetal skeleton is a unit derived from any compound represented by the following formula (2):

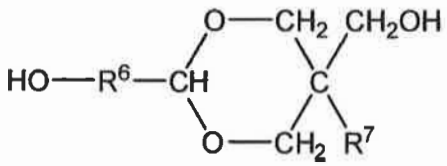
[Formula 2]



(2)

(wherein R^4 and R^5 each independently represent any divalent substituent selected from the group consisting of an aliphatic hydrocarbon group having 1 to 10 carbon atoms, an alicyclic hydrocarbon group having 3 to 10 carbon atoms, and an aromatic hydrocarbon group having 6 to 10 carbon atoms) or the following formula (3):

[Formula 3]



(3)

(wherein R^6 represents any divalent substituent selected from the group consisting of an aliphatic hydrocarbon group having 1 to 10 carbon atoms, an alicyclic hydrocarbon group having 3 to 10 carbon atoms, and an aromatic hydrocarbon group having 6 to 10 carbon atoms; and R^7 represents any monovalent substituent selected from the group consisting of an aliphatic hydrocarbon group having 1 to 10 carbon atoms, an alicyclic hydrocarbon group having 3 to 10 carbon atoms, and an aromatic hydrocarbon group having 6 to 10 carbon atoms.)

[Claim ~~8~~7]

The method for producing the polyester resin according to claim ~~7~~6, wherein the diol unit having a cyclic acetal skeleton is a unit derived from 3,9-bis(1,1-dimethyl-2-hydroxyethyl)-2,4,8,10-tetraoxaspiro[5.5]undecane or 5-methylol-5-ethyl-2-(1,1-dimethyl-2-hydroxyethyl)-1,3-dioxane.