alkaline due to a secondary amino group which remains in the prepolymer, and thereby a hydrolysis of an alkoxysilyl group proceeds. As a result, gelation occurs or viscosity increases and a problem such as poor storage stabilty arises.

[0003]

As a process for eliminating an amino group which is alkaline, a process in which a silane compound having an amino group is added to an α-β-unsaturated carbonyl compound to form an alkoxysilane compound, and subsequently, the alkoxysilane compound is added to a urethane prepolymer is proposed (see, for example, Patent Document 3). However, when a polyurethane resin having low modulus and high elongation is produced by the above-mentioned process, the viscosity of the polyurethane resin increases and the handling property deteriorates. In addition, the production process is complex and expensive.

[0004]

Patent Document 1: JP-A-03-047825

Patent Document 2: JP-A-03-157424

Patent Document 3: JP-A-2000-169544

SUMMARY ~~OF THE INVENTION~~

[0005]

An object of the present ~~invention~~ disclosure is to provide a non-solvent type polyurethane resin which may be preferably used for a curable composition having physical properties after curing of low modulus and high elongation and which

is excellent in adhesion, physical properties, handling property and storage stability and a process for producing the polyurethane resin without difficulty and at low cost.

[0006]

The present inventors have found that the object is accomplished by a polyurethane resin obtained by reacting a urethane prepolymer obtained by reacting a mixture of a monool and a polyol, having on average 1.3 to 2.1 of the terminal hydroxyl groups, and a polyisocyanate, and a compound having a crosslinkable silyl group, an imino group and an amino group in a molecule.

The present ~~invention~~ disclosure is intended to provide the following embodiments.

[1] A polyurethane resin obtained by reacting

(1) a urethane prepolymer obtained by reacting

(a) a mixture of a monool and a polyol, having on average 1.3 to 2.1 of terminal hydroxyl groups, and

(b) a polyisocyanate, and

(2) a compound having a crosslinkable silyl group, an imino group and an amino group in a molecule, of the following formula I:

$(R^1O)_n$-SiR_{3-n}-R^2-NH-R^3-NH_2 (formula I)

wherein R represents a methyl group or an ethyl group,

R^1 represents a methyl group or an ethyl group,

R^2 represents a hydrocarbon group having 2-10 carbon atoms,

R^3 represents a hydrocarbon group having 2-10 carbon atoms.

[2] The polyurethane resin according to [1], the polyol has

a number-average molecular weight (Mn) of 500 to 30000.

[3] The polyurethane resin according to [1] or [2], the polyol is a polyoxypropylene diol.

[4] The polyurethane resin according to [1], the reaction of the mixture (a) of a monool and a polyol and the polyisocyanate (b) is carried out in a range of NCO/OH equivalent ratio of 1.6 to 2.5.

[5] The polyurethane resin according to any one of [1] to [4], the reaction of said prepolymer and the compound of the formula I is carried out in a range of NCO/NH_2 equivalent ratio of 0.6 to 1.2

[6] A production process of a polyurethane resin, characterized in that

(1) a urethane prepolymer obtained by reacting

(a) a mixture of a monool and a polyol, having on average 1.3 to 2.1 of terminal hydroxyl groups, and

(b) a polyisocyanate, and

(2) a compound having a crosslinkable silyl group, an imino group and an amino group in a molecule, of the following formula I:

$(R^1O)_n-SiR_{3-n}-R^2-NH-R^3-NH_2$ (formula I)

wherein R represents a methyl group or an ethyl group,

R^1 represents a methyl group or an ethyl group,

R^2 represents a hydrocarbon group having 2-10 carbon atoms,

R^3 represents a hydrocarbon group having 2-10 carbon atoms,

are reacted.

[0006A] In one aspect of the present disclosure, there is provided a polyurethane resin obtained by reacting (1) a urethane prepolymer obtained by reacting (a) a mixture of a monool and a polyol, having on average 1.3 to 2.1 of terminal hydroxyl groups, and (b) a polyisocyanate, and (2) a compound having a crosslinkable silyl group, an imino group and an amino group in a molecule, of the following formula I: $(R^1O)_n$-SiR_{3-n}-R^2-NH-R^3-NH_2 (formula I)

wherein R represents a methyl group or an ethyl group,

R^1 represents a methyl group or an ethyl group,

R^2 represents a hydrocarbon group having 2-10 carbon atoms,

R^3 represents a hydrocarbon group having 2-10 carbon atoms,

n is 1, 2 or 3,

wherein the reaction of the mixture (a) of a monool and a polyol and the polyisocyanate (b) is carried out in a range of NCO/OH equivalent ratio of 1.6 to 2.5, the reaction of said prepolymer (1) and the compound (2) of the formula I is carried out in a range of NCO/NH_2 equivalent ratio of 0.6 to 1.2, and the mixture (a) of a monool and a polyol is obtained by mixing 20 to 80 wt.% of a monool and 80 to 20 wt.% of a polyol, based on the whole amount of the mixture (a).

[0006B] In another aspect of the present disclosure, there is provided a production process of a polyurethane resin, wherein (1) a urethane prepolymer obtained by reacting (a) a mixture of a monool and a polyol, having on average 1.3 to 2.1 of terminal hydroxyl groups, and (b) a polyisocyanate, and (2) a compound having a crosslinkable silyl group, an imino group and an amino group in a molecule, of the following formula I:

$(R^1O)_n$-SiR_{3-n}-R^2-NH-R^3-NH_2 (formula I)

wherein R represents a methyl group or an ethyl group,

R^1 represents a methyl group or an ethyl group,

R^2 represents a hydrocarbon group having 2-10 carbon atoms,

R^3 represents a hydrocarbon group having 2-10 carbon atoms,

are reacted,

n is 1, 2 or 3,

wherein the reaction of the mixture (a) of a monool and a polyol and the polyisocyanate (b) is carried out in a range of NCO/OH equivalent ratio of 1.6 to 2.5, the reaction of said prepolymer (1) and the compound (2) of the formula I is carried out in a range of NCO/NH_2 equivalent ratio of 0.6 to 1.2, and the mixture (a) of a monool and a polyol is obtained by mixing 20 to 80 wt.% of a monool and 80 to 20 wt.% of a polyol, based on the whole amount of the mixture (a)