or lower (see, for example, Patent Document 4).

PRIOR ART DOCUMENTS

PATENT DOCUMENTS

[0005]

Patent Document 1: Japanese Patent Laid-open Publication No. 2008-308549

Patent Document 2: Japanese Patent Laid-open Publication No. 2005-105246

Patent Document 3: Japanese Patent Laid-open Publication No. 1993-200946

Patent Document 4: Japanese Patent Laid-open Publication No. 2004-277619

SUMMARY

PROBLEMS TO BE SOLVED

[0006]

However, even a polyimide resin improved in adhesion force cannot be pressure bonded to another substrate at room temperature and therefore cannot be used as an adhesive.

[0007]

In view of such situations, it is an object of the embodiments disclosed herein to provide a polyimide resin that generates no volatiles due to decomposition or the like even at high temperatures of 250°C or higher and exhibits satisfactory adhesiveness at room temperature, and also provide an adhesive resin and an adhesive resin laminated film using the same.

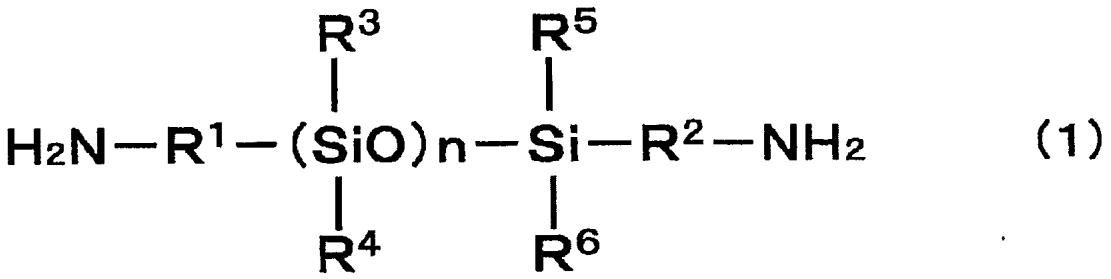
SOLUTIONS TO THE PROBLEMS

[0008]

That is, the present disclosure is directed to a polyimide resin having at least a tetracarboxylic dianhydride residue and a di-amine residue and having a glass transition temperature of 30°C or lower, wherein a residue of a polysiloxane di-amine represented by general formula (1) is contained as the di-amine residue.

[0009]

[Chemical Formula 1]



$$H_2N-R^1-(SiO)n-Si-R^2-NH_2 \qquad (1)$$

[0010]

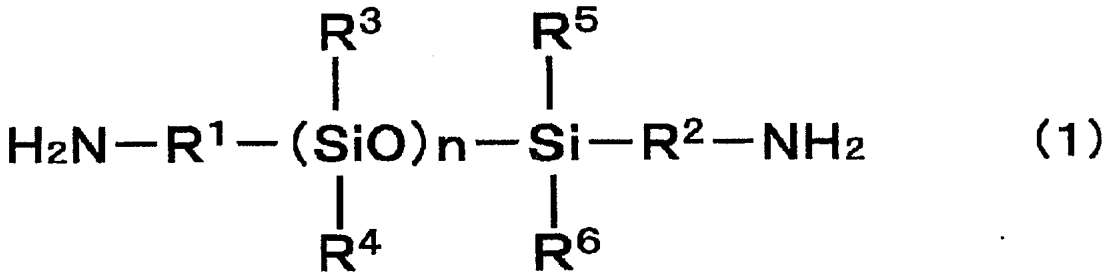
n is a natural number and the average calculated from the average molecular weight of the polysiloxane di-amine is within the range of from 5 to 30. R^1 and R^2 may be the same or different and each represent an alkylene group having 1 to 30 carbon atoms or a phenylene group. R^3 to R^6 may be the same or different and each represent an alkylene group having 1 to 30 carbon atoms, a phenyl group, or a phenoxy group.

[0010a]

In an aspect, there is provided a polyimide resin having at least

a tetracarboxylic dianhydride residue and a di-amine residue and having a glass transition temperature of 30°C or lower, wherein a residue of a polysiloxane di-amine represented by general formula (1) is contained as the di-amine residue,

[Chemical Formula 1]



(1)

wherein n is a natural number and the average calculated from the average molecular weight of the polysiloxane di-amine is within the range of from 5 to 30; R^1 and R^2 may be the same or different and each represent an alkylene group having 1 to 30 carbon atoms or a phenylene group; R^3 to R^6 may be the same or different and each represent an alkylene group having 1 to 30 carbon atoms, a phenyl group, or a phenoxy group,

wherein the residue of the polysiloxane di-amine represented by general formula (1) is contained as the di-amine residue in an amount of 70 mol% or more of all di-amine residues, and

wherein the polysiloxane di-amine represented by generalformula (1) is one or more selected from the group consisting of:

α,ω-bis(3-aminopropyl)polydimethylsiloxane,

α,ω-bis(3-aminopropyl)polydiethylsiloxane,

α,ω-bis(3-aminopropyl)polydipropylsiloxane,

α,ω-bis(3-aminopropyl)polydibutylsiloxane,

α,ω-bis(3-aminopropyl)polydiphenoxysiloxane,

α,ω-bis(2-aminoethyl)polydimethylsiloxane,

α,ω-bis(2-aminoethyl)polydiphenoxysiloxane,

α,ω-bis(4-aminobutyl)polydimethylsiloxane,

α,ω-bis(4-aminobutyl)polydiphenoxysiloxane,

α,ω-bis(5-aminopentyl)polydimethylsiloxane,

α,ω-bis(5-aminopentyl)polydiphenoxysiloxane,

α,ω-bis(4-aminophenyl)polydimethylsiloxane, and

α,ω-bis(4-aminophenyl)polydiphenoxysiloxane.

[0010b]

In another aspect, there is provided a resin composition comprising at least the polyimide resin as defined above.

[0010c]

In another aspect, there is provided a laminated film in which the resin composition as defined above is laminated on at least one side of a heat-resistant insulation film.

[0010d]

In another aspect, there is provided a laminated film as defined above, wherein a release treated film is further laminated on the surface of the laminated resin composition.

EFFECTS

[0011]

According to the present disclosure, there can be provided a highly heat-resistant polyimide resin that exhibits good adhesiveness at room temperature and is prevented from generation of volatiles due to decomposition or the like even at high temperatures equal to or higher than 250°C, and an adhesive resin and an adhesive resin-laminated film using the same.

EMBODIMENTS OF THE INVENTION

[0012]

The polyimide resin of the present invention can be used in the form of an adhesive laminated film or an adhesive laminated substrate by being laminated to a heat-resistant insulation film, a glass substrate, or the like.

[0013]

The glass transition temperature of the polyimide resin of the present invention is 30°C or lower, and preferably 20°C or lower. If the glass transition temperature is 30°C or lower, satisfactory adhesiveness is exhibited when a substrate, which serves as an adherend, is pressure bonded to an adhesive film formed using the polyimide resin of the present invention. The lower limit of the glass transition temperature, which is not particularly limited, is preferably -30°C or higher, and more preferably is -20°C or higher. If the glass transition temperature is -30°C or higher, moderate tackiness is exhibited, so that, for example, a release treated protective film can be