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(54) Titre : COMPOSITIONS A BASE DE POLYURETHANE DURCISSABLES A L'HUMIDITE
(54) Title: MOISTURE CURABLE POLYURETHANE COMPOSITIONS

(57) Abrégé/Abstract:
The present invention relates to hydrocurable compositions suitable for use as coatings, sealants or caulks. More specifically, the compositions of the present invention contain free-isocyanate, aromatic prepolymer in combination with free-isocyanate aliphatic prepolymer to provide an unexpected improvement in the physio-mechanical properties of the final cured product.

ABSTRACT OF THE INVENTION

The present invention relates to hydrocurable compositions suitable for use as coatings, sealants or caulks. More specifically, the compositions of the present invention contain free-isocyanate, aromatic prepolymer in combination with free-isocyanate aliphatic prepolymer to provide an unexpected improvement in the physio-mechanical properties of the final cured product.

MOISTURE CURABLE POLYURETHANE COMPOSITIONS

Field of the Invention

The present invention relates to hydrocurable compositions suitable for use as coatings, sealants, caulks and the like. More specifically, the compositions of the present invention contain free-isocyanate, aromatic prepolymer in combination with free-isocyanate aliphatic prepolymer to provide an unexpected improvement in the physio-mechanical properties of the final cured product.

Background of the Invention

Polyurethane sealants in general are known and oftentimes comprise aromatic, free-isocyanate prepolymers. Such prepolymers are known to readily react with ambient humidity to provide an amine which will in turn react with another free isocyanate to thereby provide a cured product. Such a curing chemistry has been used in urethane sealants. Such sealant systems however can be problematic.

The physio-mechanical properties of the cured products can be less than satisfactory, because the ambient moisture available for the curing reaction may fluctuate within a wide range. This is particularly true for products used in the construction industry, such as sealants, caulks or specialty coatings which are applied under a variety of different temperature and humidity conditions.

Objects Of The Invention

It is an object of the present invention to provide moisture curable polyurethane products with better overall properties and less sensitivity to application conditions.

Other objects and features of the present invention will become apparent to those of ordinary skill in the art upon further review of this specification and accompanying claims.

Summary Of The Invention

The present invention is directed to a sealant composition comprising:

1) an aromatic, free-isocyanate prepolymer; and

2) an aliphatic free-isocyanate prepolymer. Both prepolymers are preferably gravity flowable having a weight average molecular weight in the range of about 400 to about 10,000.

The aromatic prepolymer is preferably obtained by the reaction of a polyol with an excess equivalent of an aromatic: isocyanate monomer *or* prepolymer (about two equivalents of NCO per hydroxy group). The aromatic monomer or prepolymer preferably comprises at least two isocyanate groups *per* molecule, and the polyol is preferably an alkyl or arylakyl polyol.

The term "aliphatic" is employed herein to embrace both non-cyclic and cyclic aliphatic, in the reference to the prepolymer.

The aliphatic prepolymer preferably comprises the reaction product of an alkyl polyol with an excess equivalent of an aliphatic isocyanate monomer or prepolymer (about two equivalents of NCO per hydroxy group). "Aliphatic isocyanate monomer or prepolymer" as used herein is intended to mean that the isocyanate is linked to the monomer or prepolymer by an aliphatic chain of at least one carbon atom. The aliphatic isocyanate component of the present invention can have an aromatic constituent, provided the isocyanate is not directly bonded to the aromatic group.

Preferably, the weight ratio of the aromatic component to the aliphatic component is in the range of about 100:1 to about 1:1. The most preferred aromatic prepolymer is the reaction product of polytetramethylene glycol with an excess equivalent of 4,4'diphenylmethane diisocyanate. The most preferred aliphatic prepolymer is the reaction product of polyoxypropylene diol with an excess equivalent of dicyclohexamethylene diisocyanate.

It has been surprisingly discovered that a substantial improvement in the physio-mechanical properties of urethane compositions can be achieved when aliphatic (poly) isocyanate prepolymer is added to a curing system containing aromatic isocyanate prepolymers.

Detailed Description Of The Preferred Embodiment

The present invention is directed to a sealant composition comprising:

(A) an aromatic, free-isocyanate prepolymer which is preferrably gravity flowable having a weight average molecular weight in the range of about 400 to about 10,000, wherein the prepolymer is preferably obtained by the reaction of a polyol with an excess equivalent (about two equivalents of NCO per hydroxy group) of an aromatic polyisocyanate monomer or prepolymer; and

(B) an aliphatic, free-isocyanate prepolymer which is preferrably gravity flowable having a weight average molecular weight in the range of about 400 to about 10,000, wherein the prepolymer is obtained by the reaction of a polyol with an excess equivalent (about two equivalents of NCO per hydroxy group) of an aliphatic polyisocyanate.

The aliphatic prepolymer can have aromatic constituent, provided the free isocyanate group is not linked directly to the aromatic constituent. Preferrably the isocyanate is bonded to a short chain aliphatic, preferrably unsubstituted aliphatic.

The aromatic or aliphatic polyisocyanates of the present invention are preferrably organic isocyanates having at least two isocyanate groups per molecule. The aliphatic polyisocyanate can be of low, high or intermediate molecular weight and can be any of a wide variety of organic polyisocyanates, including 1,6-hexylmethylene diisocyanate, tetramethylxylene diisocyanates, 4,4'-dicyclohexylmethane diisocyanate, isophorone diisocyanate ethylene diisocyanate, trimethylene diisocyanate, dodecamethylene diisocyanate, hexamethylene diisocyanate, hexymethylene diisocyanate trimer, tetraethylene diisocyanate, pentamethylene diisocyanate, propylene 1,2 diisocyanate, 1,4-diisocyanate cyclohexane, cyclopentene-1,3-diisocyanate, butane 1,2,3-triisocyanat and the like.

The aromatic polyisocyanate can be any one of a variety of organic polyisocyanates, including 4,4'-diphenylmethane diisocyanate, toluene diisocyanate (TDI), p-phenylene diisocyanate, 1-methyl phenylene-2,4,-diisocyanate, naphthalene-1,4'diisocyanate,

benzene-1,2,4-tetraisocyanate butane, and the like. Polyisocyanates which are polymeric in nature including isocyanate prepolymers of all types are included in this invention.

The polyols useful in synthesizing the either component of the present invention include those having at least two hydroxyl groups per molecule and have equivalent weights falling in the range of from about 30 to 5000. Specific polyols useful in synthesizing the first component prepolymer include amide diols, urethane diols, polyether polyols, polyester polyols, and the like.

Polyhydroxy polyethers can be prepared by polymerization of epoxides such as ethylene oxide, propylene oxide, butylene oxide, tetrahydrofuran, styrene oxide, or epichlorohydrin either on their own or by chemical addition to other materials such as ethylene glycol, propylene glycol trimethylol propanes and 4,4'-dihydroxy diphenyl propane. Sucrose polyethers also may be used. Polybutadienes having hydroxyl groups as well as other known hydroxyl containing vinyl addition polymerized polymers can be used.

For any embodiment of the present invention, the particular isocyanate prepolymer can be determined by the physical and/or mechanical properties that are desired in the resulting product. If the final product is to be a sealant, then moderate strength is necessary, together with sufficient flexibility. If the final product is to be a protective coating, then it should be tough and less flexible.

Thus, for instance, the prepolymers suitable for caulks and sealants utilize higher molecular weight polyols (1000 and higher). Typically, polyoxypropylene glycol diols and triol, as well as polytetramethylene glycol diols are preferred among others, as the polyol backbone.

Prepolymers for coatings usually utilize lower molecular weight polyols (2000 or less), with an increased amount of triol component. Polyols for coatings are preferrably selected from polyoxypropylene polyols, polytetramethylene glycols, polycaprolactones, different polyester polyols and the like.

Additives such as plasticizers, antioxidants, colorants, pigments, rheological additives, plasticizers, stabilizers and the

like may be included in the sealant. Where required, solvents such as aromatic or aliphatic hydrocarbons, esters, ketones and the like may also be used.

The sealant can be filled with fillers such as titanium dioxide, clay, spar, calcium carbonate, carbon black, talc, silica, kaolin, aluminum oxide, metal oxides, metals and the like. The preferred urethane catalysts include tertiary amines, such as triethylene diamine, N,N'N"-tris(dimethylaminopropyl)hexa-hydrotriazine, organotin catalysts, such as dibutyltin dicarboxylates, stannous octoate and the like, potas-sium octoate, iron acetyl acetonate, zinc octoate, nickel acetyl acetonate and the like and mixtures thereof.

CLAIMS

1. A moisture curable polyurethane composition comprising: a first polyurethane prepolymer comprising at least two aromatic free-isocyanate groups per molecule and a second polyurethane prepolymer comprising at least two aliphatic or cycloaliphatic free-isocyanate groups per molecule, wherein the weight ratio of aromatic isocyanate prepolymer to aliphatic isocyanate prepolymer is in the range of about 100:1 to about 1:1.

2. The composition, according to claim 1, wherein the weight ratio of aromatic to aliphatic or cycloaliphatic isocyanate prepolymer is in the range of about 10:1 to about 2:1.

3. The composition, according to claim 1 or 2, wherein the aliphatic or cycloaliphatic isocyanate prepolymer is derived from 4,4'-dicyclohexylmethane diisocyanate.

4. The composition, according to claim 1 or 2, wherein the aliphatic or cycloaliphatic isocyanate is an isocyanate terminated urethane prepolymer.

5. The composition, according to claim 1, 2, 3 or 4, wherein said first and second prepolymers each have a weight average molecular weight in the range of about 400 to about 10,000.