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Composition for the preparation of silicone rubber masses

The present invention relates to a catalyst for crosslinking silicone rubber masses. In particular, the present invention provides a composition for preparing a silicone rubber mass. In particular, the present invention already provides a composition for preparing a silicone rubber mass, the composition comprising said catalyst. In addition, the present invention provides a use of the catalyst for crosslinking a silicone rubber mass, and a use of the composition according to the invention for preparing a silicone rubber mass, in particular for use as a sealant, adhesive or coating agent.

Background of the invention

Cold-curing silicone rubber masses, also called RTV (room-temperature-curing) silicone rubber masses, have long been known as tailor-made materials with elastic properties. They are commonly used as sealants or adhesives for glass, porcelain, ceramics, stone, plastics, metals, wood, etc., e. g. as jointing or sealing compounds in construction and sanitary applications, or as coating materials, e. g. in the electronics industry, (Römpp Chemie Lexikon, CD ROM, Version 2.0, ed. J. Falbe, Thieme-Verlag, Stuttgart 1999 as well as Ullmann's Encyclopedia of Technical Chemistry, 4th edition, ed. E. Bartholome, Verlag Chemie, Weinheim 1982, vol. 21, p. 511 ff.). In particular, one-component RTV silicone rubber masses (RTV-1) are used; these are, for example, plastically moldable mixtures of α , ω -dihydroxypolyorganosiloxanes and suitable crosslinkers (also referred to in the field as crosslinking agents or curing agents), which can be stored under exclusion of moisture (e. g. in a suitable cartridge), but polymerize under the influence of water or humidity at room temperature. Polymerization usually occurs by condensation of SiOH groups with suitable hydrolyzable SiX groups of the crosslinkers.

Depending on the desired chemical and physical properties of the polymerization product, such as the desired degree of crosslinking, solvent resistance, etc., various polyfunctional, e. g. tri- and/or tetrafunctional crosslinkers (curing agents) are generally used together with various difunctional polyorganosiloxane compounds or polyorganosiloxane compounds carrying several functional groups. In particular, α , ω -dihydroxypolyorganosiloxanes are frequently used as difunctional polyorganosiloxane compounds.

RTV-1 silicone rubber masses are classified into acidic (HX = acids, such as acetic acid, etc.), basic (e.g. HX = amines, etc.) and neutral (e.g. HX = alcohols, oximes, etc.) systems on the basis of the leaving groups (HX) released during hydrolysis of the crosslinker. Currently available RTV-1 silicone rubber masses generally contain acidic crosslinking systems, which hydrolyze under delivery of acetic acid, or neutral crosslinking systems, which hydrolyze under delivery of oxime compounds, such as butan-2-onoxime (or methyl ethyl ketoxime, MEKO).

For the desired wide range of application of silicone rubber masses, they should adhere to as many surfaces as possible, such as wood, painted wood, glazed wood, metals, such as steel, aluminum, powder-coated aluminum, glass, plastics, such as polyvinyl chloride (PVC), polyamide, concrete, etc. In addition, the silicone rubber masses should be storage stable in a standard cartridge, i.e. their properties should not change depending on the storage time, and preferably both in a cartridge sealed after filling and in a cartridge that has already been opened and/or partially emptied. Finally, the polymerization product should be transparent or clear after completed crosslinking (curing) of the silicone rubber mass.

In addition to the appropriate selection of the actual polymer components, such as crosslinker and polyorganosiloxane, a catalyst is usually added to control the polymerization rate and/or degree of polymerization, by means of which important product properties of the silicone rubber masses are influenced, such as, e.g. skin formation time (i.e. the time in which a first complete skin forms on an applied compound), tack-free time (i.e. the time after which the compound no longer exhibits tackiness), through-curing (i.e. the time in which polymerization is complete), etc. For example, the properties required for commercial silicone sealants are a skin-forming time of 5 to 15 minutes, a tack-free time of 15 to 120 minutes, and a through-cure of no more than 7 days for an application with a height of 10 mm. Further information on skin formation time, tack-free time and through-curing can be found, for example, in the "Praxishandbuch Dichtstoffe" (3rd edition 1990) published by the Industrieverband Dichtstoffe e.V. (IVD). (IVD).

Up to now, the catalyst used for silicone rubber masses has been an organometallic catalyst of the type commonly used for condensation-curing polysiloxanes, in particular a catalyst based on an organotin compound, such as an alkyl tin carboxylate, in particular dibutyl tin dilaurate and dioctyl tin dilaurate. However, such organotin compounds have toxicological properties that have led to restrictions on their use in commercially available products (see EU Directive 76/769/EEC of May 28, 2009).

Alternatively, another catalyst that does not comprise an organotin compound has been used in the prior art for crosslinking polysiloxanes.

For example, a titanium-based compound can be used as a catalyst, as described, for example, in EP 1 230 298 A1 and EP 2 290 007 A1. However, it is known that a catalyst based on a titanium compound can lead to yellowing and/or surface tackiness in the products, as well as having a slow vulcanization rate, poor storage stability and incompatibility with common aminosilane-based adhesion promoters.

Furthermore, EP 1 230 298 A1 describes a catalyst based on amines and metal salts of tin, zinc, iron, lead, barium and zirconium as well as on chelates of tin. This catalyst leads to products with a low yellowing, but is a slow catalyst according to EP 2 290 007 A1.

Therefore, EP 2 290 007 A1 proposes a catalyst based on metal compounds of I. and II. main and subgroups, i.e. Li, Na, K, Rb, Cs, Be, Mg, Ca, Sr, Ba, Cu, Ag, Au, Zn, Cd and Hg, in the form of pure carboxylates which, when an acidic co-catalyst in the form of an organic or inorganic acid is added, give a product with acceptable curing characteristics. EP 2 290 007 A1 describes the use of this catalyst in silicone rubber masses with crosslinkers (curing agents) which deliver acidic (acetic acid) or neutral (alcohols or MEKO) compounds during hydrolysis, in particular using a catalyst consisting of a Li carboxylate or of a Sr carboxylate.

The use of a catalyst based on Li, Na, K, Mg, Ca, Sr compounds without additional simultaneous use of an acidic co-catalyst is described in EP 2 280 041 A1. There it is further described that in particular the use of octasoligem lithium or octosoligem strontium in combination with alkoxy-, acetoxy- or oximo-RTV-1 yields products with desired properties.

Object of the invention

However, the inventors of the present invention have found that it is not possible to use the above-described known tin-free catalysts in combination with known silicone rubber masses that have been optimized using tin-organic compound-based catalysts while maintaining the optimized product properties of the silicone rubber masses. Merely replacing a tin-based catalyst

with one of the known tin-free catalysts does not yield a product (RTV-1) with the desired properties. Thus, it was found that sealants prepared with the known tin-free catalysts exhibit poor adhesion as well as insufficient storage stability. In particular, with acetate crosslinkers, poor through-curing was also observed.

It is therefore an object of the invention to provide an improved catalyst for silicone rubber masses that is not only tin-free, but also maintains all the properties desired for RTV-1 in product compositions that have been optimized using catalysts based on tin-organic compounds.

The object of the invention is solved by the subject matter of the independent claims. Preferred embodiments are the subject matter of the dependent claims.

Brief description of the invention

To solve the above problem, the present invention provides: a catalyst for cross-linking silicone rubber mass; a composition for preparing a silicone rubber mass, the composition comprising said catalyst; a use of the catalyst for cross-linking a silicone rubber mass; and a use of the composition according to the invention for preparing a silicone rubber mass, in particular for use as a sealant, adhesive or coating agent.

Through extensive studies, the inventors of the present invention have surprisingly found that the object of the invention can be solved by using as catalyst in a silicone rubber mass, using not a single tin-free compound as in the prior art, but a mixture of at least two tin-free compounds with catalytic activity. Such a mixture of individual catalysts has not been used before, but in addition to the toxicological advantages, it offers the additional advantage that it can be easily adapted to existing compositions.

Detailed description of the invention

The present invention provides a composition comprising at least one organosilicone compound, at least one crosslinker, and a catalyst. The composition according to the invention can be used to prepare a silicone rubber mass.

The present invention uses a catalyst for the crosslinking of silicone rubber masses. The catalyst contained in the composition according to the invention or used in the application according to the invention comprises a metal salt of a carboxylic acid which is a zinc salt of one or more branched saturated carboxylic acids having six to nineteen carbon atoms, and a metal salt of a carboxylic acid selected from a bismuth salt, a calcium salt, a potassium salt, a lithium salt, a magnesium salt and a sodium salt of each of one or more branched saturated carboxylic acids having six to nineteen carbon atoms.

The catalyst contained in the composition according to the invention or used in the application according to the invention is thus a mixture of at least two mutually different compounds, preferably from two to twenty mutually different compounds, more preferably from two to eight mutually different compounds, and particularly preferably from two or three mutually different compounds.

Particularly preferably, the catalyst comprises exactly two mutually different metal salts of carboxylic acids. Preferably, these are two metal salts of different metals. Particularly preferably, the two metal salts of carboxylic acids are comprised in the catalyst in a ratio of the numbers of the respective metal atoms (numerical ratio) of 2:1 to 1:2, more preferably of 1.3:1 to 1:1.3, more preferably of 5:4 to 4:5, even more preferably of 1.2:1 to 1:1.2, still more preferably of 1.1:1 to 1:1.1, and especially preferably of about 1:1.

Each one of the compounds included in the catalyst is a metal salt of one or more carboxylic acids.

In this context, the term "carboxylic acid" means an organic compound, preferably a hydrocarbon, having at least one carboxyl group -COOH . Preferably, a carboxylic acid comprises a hydrocarbon comprising from 1 to 25 carbon atoms, preferably from 5 to 20 carbon atoms, and more preferably from 6 to 19 carbon atoms. The hydrocarbon of the carboxylic acid may be saturated, unsaturated or aromatic, or comprise corresponding bonds. The hydrocarbon of the carboxylic acid may comprise a straight-chain or branched hydrocarbon chain, and/or rings of hydrocarbons and/or suitable heteroatoms. Preferably, the carboxylic acid comprises a saturated hydrocarbon (alkane) comprising a straight-chain or branched hydrocarbon chain. The carboxylic acid may comprise one or more carboxyl groups, preferably one, two or three carboxyl groups. Monocarboxylic acids and dicarboxylic acid are particularly preferred. In particularly preferred dicarboxylic acids, the two carboxyl groups are attached to adjacent carbon atoms. Monocarboxylic acids are especially preferred.

A particularly preferred carboxylic acid is 2-ethylhexanoic acid.

A "metal salt of a carboxylic acid" within the meaning of the present invention is a compound comprising at least one carboxylate anion and at least one metal cation. In this context, a carboxylate anion is the anion formed by deprotonation of a carboxyl group of a carboxylic acid. Thus, a carboxylate anion in the sense of the present invention is an organic compound, preferably a hydrocarbon, having at least one carboxylate group -COO^- , which can be formed from any of the carboxylic acids described above. The metal cation is a cation of the respective metal, preferably in an oxidation state stable under the conditions of use. Accordingly, the metal cation preferably has a positive charge of +1 to +4, further preferably of +1 or +2 or +3. Examples of a monovalent metal cation include K^+ , Li^+ and Na^+ . Examples of a divalent metal cation (charge +2) are Ca^{2+} , Mg^{2+} and Zn^{2+} , and an example of a trivalent metal cation (charge +3) is Bi^{3+} . For a charge-neutral compound, the charge of the metal cation can be balanced by the number of monovalent negatively charged carboxylate groups, so that the ratio of metal cation to carboxylate group in the metal salt can be 1:1, 1:2, 1:3, etc., up to the maximum charge, depending on the charge of the metal cation. For example, in the case of monocarboxylic acids, the ratio of metal to carboxylic acid is 1:1 for monovalent metal cations, 1:2 for divalent metal cations, 1:3 for trivalent metal cations, and so on. For dicarboxylic acids with two carboxylate groups, the ratio is adjusted accordingly so that, for example, for divalent metal cations, the ratio of metal to dicarboxylate may be 1:1, etc. The metal salt may contain carboxylate anions of a single carboxylic acid, or carboxylate anions of several different carboxylic acids. For example, the metal salt of a divalent metal cation may contain a carboxylate anion of a first carboxylic acid ($\text{R}^1\text{-COO}^-$) and a carboxylate anion of a second carboxylic acid different therefrom ($\text{R}^2\text{-COO}^-$).

In addition to metal cation and carboxylate anion(s), the metal salt of a carboxylic acid may also comprise other components, such as anions other than carboxylate anions, e.g. halide anions, nitrate anions, sulfate anions, or the like, or neutral molecules, e.g. solvate molecules, or the like.

Particularly preferably, the metal salts of the carboxylic acids are included in the catalyst in a ratio of the numbers of the respective metal atoms (number ratio) of 2:1 to 1:2, more preferably from 1.3:1 to 1:1.3, more preferably from 5:4 to 4:5, more preferably from 1.2:1 to 1:1.2, even more preferably from 1.1:1 to 1:1.1, and particularly preferably from about 1:1.

It was surprisingly found that a catalyst for the crosslinking of silicone rubber masses, which comprises at least two mutually different metal salts of carboxylic acids according to the definition given above, imparts particularly advantageous product properties in the production of silicone rubber masses, in particular RTV-1 silicone rubber masses. The catalyst can advantageously be used without the need for a co-catalyst.

It has been found that products with particularly advantageous properties can be provided in this way. Further preferred are anions of saturated and unsaturated carboxylic acids with six to ten carbon atoms. Further preferred are anions of saturated carboxylic acids with a branched hydrocarbon chain. Particularly preferred are anions of a carboxylic acid with a branched hydrocarbon chain of eight carbon atoms. A particularly preferred embodiment of a carboxylic acid is 2-ethylhexanoic acid.

The catalyst contained in the composition according to the invention or used in the use according to the invention comprises a metal salt of a carboxylic acid which is a zinc salt of one or more branched saturated carboxylic acids having six to nineteen carbon atoms, and a metal salt of a carboxylic acid selected from a bismuth salt, a calcium salt, a potassium salt, a lithium salt, a magnesium salt and a sodium salt of each of one or more branched saturated carboxylic acids having six to nineteen carbon atoms.

Particularly preferably, the metal salts of the carboxylic acids in the catalyst are comprised in a ratio of the number of zinc atoms of the zinc salt of a carboxylic acid to the number of metal atoms of the metal salt of a carboxylic acid (number ratio) of 2:1 to 1:2, more preferably from 1.3:1 to 1:1.3, further preferably from 5:4 to 4:5, further preferably from 1.2:1 to 1:1.2, even more preferably from 1.1:1 to 1:1.1, and most preferably about 1:1.

It was found that this can provide products with particularly advantageous properties.

Further preferably, the catalyst included in the composition according to the invention or used in the use according to the invention comprises a metal salt of a carboxylic acid which is a zinc salt of one or more branched saturated carboxylic acids having six to nineteen carbon atoms, and a metal salt of a carboxylic acid selected from a bismuth salt and a calcium salt of each of one or more branched saturated carboxylic acids having six to nineteen carbon atoms.

Particularly preferably, the catalyst comprises a zinc salt of a branched carboxylic acid having six to ten carbon atoms in combination with a bismuth salt of a branched carboxylic acid having six to ten carbon atoms and/or a calcium salt of a branched carboxylic acid having six to ten carbon atoms. In a particularly preferred embodiment, the catalyst comprises a zinc salt of a branched carboxylic acid having eight carbon atoms in combination with a bismuth salt of a branched carboxylic acid having eight carbon atoms and/or a calcium salt of a branched carboxylic acid having eight carbon atoms.

Particularly preferably, the catalyst contained in the composition according to the invention or used in the use according to the invention comprises zinc bis(2-ethylhexanoate). It has been found that zinc bis(2-ethylhexanoate) can be used to provide products with particularly advantageous properties.

Particularly preferably, the catalyst contained in the composition according to the invention or used in the use according to the invention comprises bismuth tris(2-ethylhexanoate). It has been found that bismuth tris(2-ethylhexanoate) can be used to provide products with particularly advantageous properties.

Particularly preferably, the catalyst contained in the composition according to the invention or used in the use according to the invention comprises calcium bis(2-ethylhexanoate). It has been found that calcium bis(2-ethylhexanoate) can be used to provide products with particularly advantageous properties.

Particularly preferably, the catalyst contained in the composition according to the invention or used in the use according to the invention comprises sodium(2-ethylhexanoate). It has been found that sodium(2-ethylhexanoate) can be used to provide products with particularly advantageous properties.

Particularly preferably, the catalyst included in the composition according to the invention or used in the use according to the invention comprises a mixture of calcium bis(2-ethylhexanoate) and zinc bis(2-ethylhexanoate). Particularly preferably, a catalyst comprising calcium bis(2-ethylhexanoate) and zinc bis(2-ethylhexanoate) is used together with an oxime crosslinker.

Particularly preferably, the catalyst comprises a mixture of calcium bis(2-ethylhexanoate) and zinc bis(2-ethylhexanoate) in a ratio of 1:1 to 1:3 (weight ratio), more preferably in a ratio of 1:1 to 1:2, and especially preferably 4:5.

This corresponds to a numerical ratio of calcium bis(2-ethylhexanoate) to zinc bis(2-ethylhexanoate) of about 1.1:1 to 1:2.8, preferably from about 1.1:1 to 1:1.9, and particularly preferably from about 1:1.2.

It has been found that a catalyst comprising calcium bis(2-ethylhexanoate) and zinc bis(2-ethylhexanoate), preferably in a ratio of 1:1 to 1:3 (weight ratio), can be used to provide products with particularly advantageous properties.

It has been found that a catalyst comprising calcium bis(2-ethylhexanoate) and zinc bis(2-ethylhexanoate), preferably in a ratio of rounded 1:1, in particular from about 1.3:1 to 1:1.3 (numerical ratios), can be used to provide products with particularly advantageous properties.

Particularly preferably, the catalyst included in the composition according to the invention or used in the use according to the invention comprises a mixture of sodium(2-ethylhexanoate) and zinc bis(2-ethylhexanoate). Particularly preferably, a catalyst comprising sodium(2-ethylhexanoate) and zinc bis(2-ethylhexanoate) is used together with an oxime crosslinker.

Particularly preferably, the catalyst comprises a mixture of sodium (2-ethylhexanoate) and zinc bis(2-ethylhexanoate) in a ratio of 4:1 to 1:4 (weight ratio), more preferably in a ratio of 1:1 to 1:3, and most preferably 1:2.

This corresponds to a numerical ratio of sodium(2-ethylhexanoate) to zinc bis(2-ethylhexanoate) of from about 8.5:1 to 1:1.9, preferably from about 2.1:1 to 1:1.4, and particularly preferably from about 1:1.1.

It has been found that a catalyst comprising sodium(2-ethylhexanoate) and zinc bis(2-ethylhexanoate), preferably in a ratio of 4:1 to 1:4 (weight ratio), can be used to provide products with particularly advantageous properties.

It has been found that products with particularly advantageous properties can be provided with a catalyst comprising sodium(2-ethylhexanoate) and zinc bis(2-ethylhexanoate), preferably in a ratio of rounded 1:1, in particular from about 1.3:1 to 1:1.3 (numerical ratios).

Particularly preferably, the catalyst included in the composition according to the invention or used in the use according to the invention comprises a mixture of bismuth tris(2-ethylhexanoate) and zinc bis(2-ethylhexanoate). Particularly preferably, a catalyst comprising bismuth tris(2-ethylhexanoate) and zinc bis(2-ethylhexanoate) is used together with an acetate crosslinker and/or alkoxy crosslinker.

Particularly preferably, the catalyst comprises a mixture of bismuth tris(2-ethylhexanoate) and zinc bis(2-ethylhexanoate) in a ratio of 4:1 to 1:4 (weight ratio), further preferably in a ratio of 2:1 to 3:1, and more preferably 7:3.

This corresponds to a numerical ratio of bismuth tris(2-ethylhexanoate) to zinc bis(2-ethylhexanoate) of about 2.2:1 to 1:7.3, preferably from about 1.1:1 to 1:1.7, and more preferably from about 1.3:1.

It has been found that with a catalyst comprising bismuth tris(2-ethylhexanoate) and zinc bis(2-ethylhexanoate), preferably in a ratio of 4:1 to 1:4 (weight ratio), products with particularly advantageous properties can be provided.

It has been found that a catalyst comprising bismuth tris(2-ethylhexanoate) and zinc bis(2-ethylhexanoate), preferably in a ratio of rounded 1:1, in particular from about 1.3:1 to 1:1.3 (numerical ratios), can be used to provide products with particularly advantageous properties.

A composition according to the invention comprises at least one organosilicone compound, preferably two, three or more different organosilicone compounds. An organosilicone compound included in the composition is preferably an oligomeric or polymeric compound. The polymeric organosilicone compound is preferably a difunctional polyorganosiloxane compound, particularly preferably an α , ω -dihydroxyl-terminated polyorganosiloxane. More particularly preferred are α , ω -dihydroxyl-terminated polydiorganosiloxanes, especially α , ω -dihydroxyl-terminated polydialkylsiloxanes, α , ω -dihydroxyl-terminated polydialkenylsiloxanes or α , ω -dihydroxyl-terminated

polydiarylsiloxanes. In addition to homopolymeric α,ω -dihydroxyl-terminated polydiorganosiloxanes, heteropolymeric α,ω -dihydroxyl-terminated polydiorganosiloxanes with different organic substituents can also be used, including both copolymers of monomers with identical organic substituents on a silicon atom as well as copolymers of monomers with different organic substituents on a silicon atom, e.g. those with mixed alkyl, alkenyl and/or aryl substituents. The preferred organic substituents include straight-chain and branched alkyl groups with 1 to 8 carbon atoms, in particular methyl, ethyl, n-propyl and iso-propyl, and n-butyl, sec-butyl and tert-butyl, vinyl and phenyl. In this context, individual or all carbon-bonded hydrogen atoms in the individual organic substituents may be substituted by customary substituents, such as halogen atoms or functional groups such as hydroxyl and/or amino groups. Thus, α,ω -dihydroxyl-terminated polydiorganosiloxanes with partially fluorinated or perfluorinated organic substituents can be used or α,ω -dihydroxyl-terminated polydiorganosiloxanes with organic substituents on the silicon atoms substituted by hydroxyl groups and/or amino groups.

Particularly preferred examples of an organosilicone compound are α,ω -dihydroxyl-terminated polydialkylsiloxanes, such as α,ω -dihydroxyl-terminated polydimethylsiloxanes, α,ω -dihydroxyl-terminated polydiethylsiloxanes or α,ω -dihydroxyl-terminated polydivinylsiloxanes, and α,ω -dihydroxyl-terminated polydiarylsiloxanes, such as α,ω -dihydroxyl-terminated polydiphenylsiloxanes. Polyorganosiloxanes having a kinematic viscosity of 5,000 to 120,000 cSt (at 25° C) are preferred, especially those having a viscosity of 20,000 to 100,000 cSt, and particularly preferred those having a viscosity of 40,000 to 90,000 cSt.

Mixtures of polydiorganosiloxanes with different viscosities can also be used.

A composition according to the invention comprises at least one crosslinker. Any known crosslinker can be used. Preferred are crosslinkers based on silane compounds with hydrolyzable acetate residues and/or crosslinkers based on silane compounds with hydrolyzable oxime residues. In addition to the hydrolyzable acetate and/or oxime groups, the crosslinkers may comprise non-hydrolyzable residues, such as alkyl groups, alkenyl groups, alkynyl groups, aryl groups, and the like. Preferred non-hydrolyzable residues include methyl, ethyl, propyl, isopropyl, isobutyl, vinyl, phenyl, and the like. Preferably, the silane compound used as a crosslinker has the general formula $\text{SiX}_n\text{Y}_{(4-n)}$, wherein X means the hydrolyzable residues, Y means the non-hydrolyzable residues, and n is an integer from 1 to 4. Preferably, a crosslinker comprises three ($n = 3$) or four ($n = 4$) hydrolyzable groups.

Preferably, the crosslinker is selected from silane compounds comprising acid residues, in particular silane compounds comprising acetate residues, and silane compounds comprising oxime residues, in particular silane compounds comprising acetonoxime groups, silane compounds comprising methyl-ethyl-ketoxime groups, silane compounds comprising methyl-propyl-ketoxime groups, silane compounds comprising methyl-isobutyl-ketoxime groups and/or silane compounds comprising methyl-isopropyl-ketoxime groups.

Examples of preferred acetate crosslinkers include methyl-triacetoxysilane, ethyl-triacetoxysilane, propyl-triacetoxysilane, vinyl-triacetoxysilane, phenyl-triacetoxysilane, tetraacetoxysilane, and the like.

The acetate crosslinkers can be used as a single compound, or as a mixture of two or more acetate crosslinkers.

In addition to mixtures consisting only of acetate crosslinkers, crosslinker mixtures can also be used, which additionally comprise crosslinkers based on silane compounds with hydrolyzable alkoxy groups. Crosslinkers based on silane compounds with hydrolyzable alkoxy groups have a similar structure to acetate crosslinkers, with each acetoxy group being replaced by an alkoxy group. Alkoxy crosslinkers release neutral alcohol molecules upon hydrolysis or polymerization (polycondensation). Examples of preferred alkoxy groups include methoxy, ethoxy, propoxy, and the like. Examples of preferred alkoxy crosslinkers include methyltrimethoxysilane, ethyltrimethoxysilane, propyltrimethoxysilane, vinyltrimethoxysilane, phenyltrimethoxysilane, methyltriethoxysilane, ethyltriethoxysilane, propyltriethoxysilane, vinyltriethoxysilane, phenyltriethoxysilane, and the like.

Examples of preferred oxime crosslinkers include methyl tris(acetonoximo) silanes, ethyl tris(acetonoximo) silanes, propyl tris(acetonoximo) silanes, vinyl tris(acetonoximo) silanes, phenyl tris(acetonoximo) silanes, tetra(acetonoximo) silanes, methyl tris(methyl-ethyl-ketoximo) silanes, ethyl tris(methyl-ethyl-ketoximo) silanes, propyl tris(methyl-ethyl-ketoximo) silanes, vinyl tris(methyl-ethyl-ketoximo) silanes, phenyl tris(methyl-ethyl-ketoximo) silanes, tetra(methyl-ethyl-ketoximo) silanes, methyl tris(methyl-propyl-ketoximo) silanes, ethyl tris(methyl-propyl-ketoximo) silanes, propyl tris(methyl-propyl-ketoximo) silanes, vinyl tris(methyl-propyl-ketoximo) silanes, phenyl tris(methyl-propyl-ketoximo) silanes, tetra(methyl-propyl-ketoximo) silanes, methyl tris(methyl-isopropyl-ketoximo) silanes, ethyl tris(methyl-isopropyl-ketoximo) silanes, propyl

tris(methyl-isopropyl-ketoximo) silanes, vinyl tris(methyl-isopropyl-ketoximo) silanes, phenyl tris(methyl-isopropyl-ketoximo) silanes, tetra(methyl-isopropyl-ketoximo) silanes, methyl tris(methyl-isobutyl-ketoximo) silanes, ethyl tris(methyl-isobutyl-ketoximo) silanes, propyl tris(methyl-isobutyl-ketoximo) silanes, vinyl tris(methyl-isobutyl-ketoximo) silanes, phenyl tris(methyl-isobutyl-ketoximo) silanes, tetra(methyl-isobutyl-ketoximo) silanes, and the like.

The oxime crosslinkers can be used as a single compound, or as a mixture of two or more oxime crosslinkers.

It has been found that the composition can be stored under moisture exclusion for periods longer than 12 months and polymerizes under the influence of water or humidity at room temperature.

Particularly preferably, a composition according to the invention, comprising acetate crosslinkers, comprises a catalyst comprising bismuth tris(2-ethylhexanoate) and zinc bis-(2-ethylhexanoate). Particularly preferably, a composition according to the invention comprising oxime crosslinkers comprises a catalyst comprising calcium bis(2-ethylhexanoate) and zinc bis(2-ethylhexanoate), or a catalyst comprising sodium(2-ethylhexanoate) and zinc bis(2-ethylhexanoate).

In the presence of water or humidity, the components crosslinker (curing agent) and organosilicone compound of the composition according to the invention polymerize or condense to form silicone rubber masses with the formation of Si-O-Si bonds. The polymerization products prepared using the composition according to the invention are free of specks, transparent and clear. Thus, the composition according to the invention can be used as a sealant, adhesive, coating agent or the like.

Particularly preferably, the composition according to the invention comprises 40 to 90 wt.-% of the organosilicone compound, 1 to 15 wt.-% of the crosslinker, and 0.1 to 5.0 wt.-% of the catalyst, further preferably 0.5 to 2.0 wt.-% of the catalyst, the remainder being made up in each case by customary additives.

If desired, the composition according to the invention may comprise further customary additives. Common additives are fillers, colorants, plasticizers, thixotropic agents, wetting agents, adhesives, and others.

Both reinforcing and non-reinforcing fillers can be used as fillers. Preferred fillers are inorganic fillers, such as highly dispersed, fumed or precipitated silicas, carbon black, quartz powder, chalk, or metal salts or metal oxides, such as titanium oxides. A particularly preferred filler is a highly dispersed silica, such as that available under the name Cabosil 150 from Cabot. Fillers such as highly dispersed silicas, in particular fumed silicas, can also be used as thixotropic agents. Metal oxides can also be used as colorants, e.g. titanium oxides as white colorants. The fillers can also be surface-modified by common processes, e.g. silicas hydrophobized with silanes can be used.

As plasticizers, polydiorganosiloxanes known per se without functional end groups, which thus differ from the organosilicone compounds used according to the invention, and/or liquid aliphatic or aromatic hydrocarbons can be used, preferably those with molecular weights of about 50 to about 5,000, whose volatility is low and which are sufficiently compatible with polysiloxanes. Plasticizers preferably have a kinematic viscosity of from 1 to 5,000 cSt (at 25 °C), particularly from 50 to 500 cSt, and especially preferably from 90 to 200 cSt. Examples of plasticizers include polydimethylsiloxanes with a viscosity of 90 to 120 cSt, especially of 100 cSt, kerosene oils and polysubstituted alkylbenzenes.

Preferred wetting and/or bonding agents (adhesion promoters) are silane compounds known per se with reactive group bearing organic substituents on the silicon atom, which differ from the organosilicone compounds used according to the invention, such as organosilanes with reactive amine groups, carboxylic acid groups, epoxy groups or thiol groups. Particularly preferred examples include aminosilanes, such as aminoethyl-aminopropyl-trialkoxysilanes. Specific examples of particularly preferred bonding agents (adhesion promoters) include 3-aminopropyl-triethoxysilane, 3-aminopropyl-trimethoxysilane, aminoethylaminopropyl-trimethoxysilane, butylaminopropyl-triethoxysilane, butylaminopropyl-trimethoxysilane, propylaminopropyl-triethoxysilane, propylaminopropyl-trimethoxysilane, N-cyclohexyl-3-aminopropyl-trimethoxysilane, N-cyclohexyl-3-aminopropyl-triethoxysilane, and co-oligomers of diamino/alkyl functional silanes, which is available, for example, as Dynasylan 1146 from Degussa. Other oligomeric coupling agents can also be used.

In a further aspect, the present invention provides a use of the composition according to the invention as a sealant, adhesive, coating agent or the like. The composition is preferably used in the construction industry as a sealant or as an adhesive, in particular for joints in structural and civil engineering, glass construction and window construction (preferred) and in the sanitary

sector. There are further uses in mechanical engineering, e.g. in the automotive industry (preferred), the electrical industry, the textile industry or in industrial plant construction.

The composition according to the invention can be applied as RTV silicone rubber mass according to the desired application to any substrate, where it then polymerizes under the influence of water or air humidity at room temperature. For example, when the composition according to the invention is used as a sealant, it is introduced into a joint or the like to be sealed. When the composition according to the invention is used as an adhesive, it is applied to one or both of the parts to be joined and the parts are then joined together. The composition according to the invention is characterized by excellent adhesion to all major materials, such as wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, and many other materials. The polymer obtained is transparent and exhibits advantageous elasticity and hardness. In addition, the composition according to the invention is characterized by a short skin-forming time, tack-free time, and early stress. In addition, the composition according to the invention exhibits advantageous storage properties in the cartridge.

In another aspect, the present invention provides a use of a catalyst for crosslinking a silicone rubber mass, wherein the catalyst comprises at least two mutually different compounds independently selected from metal salts of carboxylic acids.

The catalyst used in the application according to the invention has been described in detail above.

Preferably, a catalyst comprising at least one metal salt of a carboxylic acid selected from bismuth tris(2-ethylhexanoate), calcium bis(2-ethylhexanoate), sodium(2-ethylhexanoate) and zinc bis(2-ethylhexanoate) is used.

Particularly preferably, the catalyst used comprises calcium bis(2-ethylhexanoate) and zinc bis(2-ethylhexanoate), preferably in a numerical ratio of 1.3:1 to 1:1.3.

Particularly preferably, a catalyst comprising calcium bis(2-ethylhexanoate) and zinc bis(2-ethylhexanoate) is used together with an oxime crosslinker.

Particularly preferably, the catalyst used comprises bismuth tris(2-ethylhexanoate) and zinc bis(2-ethylhexanoate), preferably in a numerical ratio of 1.3:1 to 1:1.3.

Particularly preferably, a catalyst comprising bismuth tris(2-ethylhexanoate) and zinc bis(2-ethylhexanoate) is used together with an acetate wetting agent.

Particularly preferably, the catalyst used comprises sodium(2-ethylhexanoate) and zinc bis(2-ethylhexanoate), preferably in a numerical ratio of 1.3:1 to 1:1.3.

Particularly preferably, a catalyst comprising sodium(2-ethylhexanoate) and zinc bis(2-ethylhexanoate) is used together with an oxime crosslinker.

Particularly preferably, the catalyst is used for crosslinking a silicone rubber mass comprising at least one organosilicone compound and at least one crosslinker, wherein as the at least one organosilicone compound and as the at least one crosslinker preferably the compounds described above are used.

Particularly preferably, the organosilicone compound used comprises at least one α , ω -dihydroxyl-terminated polyorganosiloxane compound, in particular a α , ω -dihydroxyl-terminated polydi-alkylsiloxane.

Particularly preferably, the crosslinker used comprises at least one compound selected from the group consisting of silane compounds comprising acid residues, in particular silane compounds with acetate residues, and silane compounds comprising oxime residues, in particular silane compounds comprising acetonoxime groups, silane compounds comprising methyl-ethyl-ketoxime groups, silane compounds comprising methyl-propyl-ketoxime groups, silane compounds comprising methyl-isobutyl-ketoxime groups and/or silane compounds comprising methyl-isopropyl-ketoxime groups.

Particularly preferably, 0.1 to 5.0 wt-% of the catalyst are used with 40 to 90 wt-% of the organosilicone compound and 1 to 15 wt-% of the crosslinker.

By using the catalyst described in accordance with the invention, crosslinking of a silicone rubber mass can be advantageously controlled according to a desired utilization, so that polymerization products with desired properties are formed.

Examples

In the examples and comparative examples, the following metal salts of carboxylic acids are used, which are available from various manufacturers, such as Gelest (Morrisville, USA). The sodium salt and the potassium salt of 2-ethylhexanoic acid were purchased from Alfa Aesar GmbH & Co. KG, Karlsruhe, Germany.

The bismuth salt of carboxylic acids used is bismuth tris(2-ethylhexanoate), which is classified under CAS No. 67874-71-9.

Calcium bis-(2-ethylhexanoate) is used as the calcium salt of carboxylic acids, which is classified under CAS No. 68409-80-3.

Potassium 2-ethylhexanoate is used as the potassium salt of carboxylic acids and is classified under CAS No. 3164-85-0.

Lithium 2-ethylhexanoate is used as a lithium salt of carboxylic acids, which is classified under CAS No. 15590-62-2.

Sodium 2-ethylhexanoate is used as the sodium salt of carboxylic acids and is classified under CAS No. 19766-89-3.

Strontium bis-(2-ethylhexanoate) is used as the strontium salt of carboxylic acids, which is classified under CAS No. 2457-02-5.

The zinc salt of carboxylic acids used is zinc bis-(2-ethylhexanoate), which is classified under CAS No. 85203-81-2.

The other chemicals used in the examples and comparative examples are available, for example, from the manufacturers listed below:

Polydimethylsiloxane (80000 cSt) from Wacker Chemie, Burghausen, Germany;

Polymethylsiloxane (100 cSt) from Dow Corning, Seneffe, Belgium;

Filler (highly dispersed silica) from Cabot Rheinfelden, Germany;

Aminopropyltriethoxysilane from Nitrochemie Aschau GmbH, Germany;

Adhesion promoter (co-oligomer based on aminoethyl aminopropyl trimethoxysilane) from Nitrochemie Aschau GmbH, Germany;

Adhesion promoter (diacetoxo-di-tert.-butoxysilane) from Nitrochemie Aschau GmbH, Germany;

Crosslinking mixtures from Nitrochemie Aschau GmbH, Germany.

Measurement of the product properties of the sealants produced

The product properties skin formation time, tack free time, early exposure, complete cure, appearance and Shore A hardness were determined for all sealants produced according to standard procedures (see e.g. "Praxishandbuch Dichtstoffe" from Industrieverband Dichtstoffe e.V., 3rd edition 1990). All measurements were carried out at conditions of 23°C and 50% humidity.

To determine the skin formation time, the time at which a complete layer of solidified material (skin) was observed on the surface of a sample strand was measured.

To determine the tack-free time, the time was measured at which the surface of a sample strand no longer exhibited tackiness.

To determine the early loading, a silicone strip of 10 mm height was applied to a sheet metal strip. The load-bearing capacity is tested by bending the strip by 90°. The time during which the skin of the silicone strip does not tear is indicated.

To determine complete curing, the sealant is applied to a glass plate with a height of 4 mm and the time taken for the sealant to cure through to the glass plate is measured.

To determine the surface crosslinking (notch strength), a sealant strip with a height of 10 mm is applied to a glass plate. After 24 hours at standard conditions (21 to 25 °C; 40 to 60 % humidity), a notch is pressed into the surface. After 10 seconds, it is checked whether the indentation is reversible.

Appearance was determined by organoleptic testing.

The Shore A hardness was determined with a Zwick-Roell measuring device (ref.: ASTM D 2240; DIN 53505; ISO 868). For this purpose, the respective sealant sample was applied with an application height of 10 mm and stored for 7 days at standard conditions (23°C/50 % humidity). The measurement was then performed after 7 days of storage at standard conditions.

Example 1:**Catalyst A**

A catalyst according to the invention is prepared, comprising calcium and zinc salts of carboxylic acids.

For Catalyst A, calcium bis-(2-ethylhexanoate) and zinc bis-(2-ethylhexanoate) are mixed in a ratio of 4:5 (weight ratio).

Example 2:**Catalyst B**

A catalyst according to the invention is prepared, comprising bismuth and zinc salts of carboxylic acids.

For catalyst B, bismuth tris(2-ethylhexanoate) and zinc bis-(2-ethylhexanoate) are mixed in a ratio of 7:3 (weight ratio).

Reference example 1:

A common tin-containing silicone rubber mass with oxime crosslinker is prepared according to the following formulation:

556.0 g	α , ω -dihydroxyl-terminated polydimethylsiloxane with a viscosity of 80,000 cSt
266.0 g	polydimethylsiloxane with viscosity 100 cSt
109.0 g	highly dispersed silica (filler)

50.5 g	crosslinker mixture of 14.5 g vinyl-tris(ethylmethylketoximo)silane and 36.0 g methyl-tris(ethylmethylketoximo)silane
18.0 g	3-aminopropyltriethoxysilane (thixotropic agent)
4.0 g	dibutyltin laureate as catalyst

After application in air, the sealant has:

- a skin formation time of 10 min
- a gluing free time of 30 min
- an early stress after 80 min
- a complete cure after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 24

Furthermore, the sealant was found to have good adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, and many other materials.

Reference example 1 illustrates the product properties of a currently common tin-containing sealant compound.

Comparative example 1:

Sealant formulation 1 (with oxime crosslinker)

A silicone rubber mass is prepared according to the following formulation:

525.0 g	α , ω -dihydroxyl-terminated polydimethylsiloxane with a viscosity of 80,000 cSt
313.0 g	polydimethylsiloxane with viscosity 100 cSt
103.0 g	highly dispersed silica (filler)
42.0 g	crosslinker mixture of 21.0 g ethyl-tris(acetonoximo)silane, 15.0 g vinyl-tris(ethylmethylketoximo)silane and 6.0 g methyl-tris(ethylmethylketoximo)silane
13.0 g	adhesion promoter (based on aminoethyl aminopropyl trimethoxysilane)
3.0 g	zinc bis(2-ethylhexanoate)

1.0 g 2-ethylhexanoic acid (co-catalyst)

After application in air, the sealant has:

- a skin formation time of 7 min
- a gluing free time of 20 min
- an early stress after 160 min
- a complete cure after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 22

Furthermore, the sealant was found to have good adhesion to wood, glazed wood, aluminum and glass. In contrast, adhesion to powder-coated aluminum, PVC, polyamide, steel and concrete is only moderate to poor.

The sealant also exhibits insufficient storage stability in the cartridge.

After only 4 weeks of storage at 60°C in the cartridge, the sealant only achieves a Shore A hardness of 12 after 7 days of curing in air. Furthermore, the sealant shows only moderate to poor adhesion to all substrates.

Comparative example 2:

Sealant formulation 1 (with oxime crosslinker)

A silicone rubber mass is prepared according to the following formulation:

525.0 g	α , ω -dihydroxyl-terminated polydimethylsiloxane with a viscosity of 80,000 cSt
313.0 g	polydimethylsiloxane with viscosity 100 cSt
103.0 g	highly dispersed silica (filler)
42.0 g	crosslinker mixture of
	21.0 g ethyl-tris(acetonoximo)silane,
	15.0 g vinyl-tris(ethylmethylketoximo)silane and
	6.0 g methyl-tris(ethylmethylketoximo)silane
13.0 g	adhesion promoter (based on aminoethyl aminopropyl trimethoxysilane)
2.9 g	zinc bis(2-ethylhexanoate)
1,1 g	octylphosphonic acid (co-catalyst)

After application in air, the sealant has:

- a skin formation time of 10 min
- a gluing free time of 25 min
- an early stress after 250 min (not acceptable).
- a complete cure after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 25

Furthermore, the sealant was found to have good adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, etc.

However, the sealant has insufficient storage stability in the cartridge.

After only 4 weeks of storage at 60°C in the cartridge, the following parameters have deteriorated:

- no notch strength after 24 h in air
- Shore A hardness after 7 days in air only 16
- yellowing of the sealant

Comparative example 3:

Sealant formulation 1 (with oxime crosslinker)

A silicone rubber mass is prepared according to the following formulation:

525.0 g	α , ω -dihydroxyl-terminated polydimethylsiloxane with a viscosity of 80,000 cSt
313.0 g	polydimethylsiloxane with viscosity 100 cSt
103.0 g	highly dispersed silica (filler)
42.0 g	crosslinker mixture of
	21.0 g ethyl-tris(acetonoximo)silane,
	15.0 g vinyl-tris(ethylmethylketoximo)silane and
	6.0 g methyl-tris(ethylmethylketoximo)silane
13.0 g	adhesion promoter (based on aminoethyl aminopropyl trimethoxysilane)
2.9 g	strontium bis(2-ethylhexanoate)
1,1 g	octylphosphonic acid (co-catalyst)

After application in air, the sealant has:

- a skin formation time of 13 min
- a gluing free time of 30 min
- an early stress after 360 min (not acceptable).
- a complete cure after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 25

Furthermore, the sealant was found to have good adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, etc.

However, the sealant has insufficient storage stability in the cartridge.

After only 4 weeks of storage at 60°C in the cartridge, the following parameters have deteriorated:

- no notch strength after 24 h in air
- Shore A hardness after 7 days in air only 17
- yellowing of the sealant

Comparative example 4:

Sealant formulation 1 (with oxime crosslinker)

A silicone rubber mass is prepared according to the following formulation:

525.0 g	α , ω -dihydroxyl-terminated polydimethylsiloxane with a viscosity of 80,000 cSt
313.0 g	polydimethylsiloxane with viscosity 100 cSt
103.0 g	highly dispersed silica (filler)
42.0 g	crosslinker mixture of
	21.0 g ethyl-tris(acetonoximo)silane,
	15.0 g vinyl-tris(ethylmethylketoximo)silane and
	6.0 g methyl-tris(ethylmethylketoximo)silane
13.0 g	adhesion promoter (based on aminoethyl aminopropyl trimethoxysilane)
2.9 g	lithium 2-ethylhexanoate
1,1 g	octylphosphonic acid (co-catalyst)

After application in air, the sealant has:

- a skin formation time of 13 min

- a gluing free time of 30 min
- an early stress after 420 min (not acceptable).
- a complete cure after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 25

Furthermore, the sealant was found to have good adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, etc.

However, the sealant has insufficient storage stability in the cartridge.

After only 4 weeks of storage at 60°C in the cartridge, the following parameters have deteriorated:

- no notch strength after 24 h in air
- Shore A hardness after 7 days in air only 15
- yellowing of the sealant

Comparative example 5:

Sealant formulation 1 (with oxime crosslinker)

A silicone rubber mass is prepared according to the following formulation:

525.0 g	α , ω -dihydroxyl-terminated polydimethylsiloxane with a viscosity of 80,000 cSt
313.0 g	polydimethylsiloxane with viscosity 100 cSt
103.0 g	highly dispersed silica (filler)
42.0 g	crosslinker mixture of
	21.0 g ethyl-tris(acetonoximo)silane,
	15.0 g vinyl-tris(ethylmethylketoximo)silane and
	6.0 g methyl-tris(ethylmethylketoximo)silane
13.0 g	Adhesion promoter (based on aminoethyl aminopropyl trimethoxysilane)
4.0 g	zinc bis(2-ethylhexanoate)

After application in air, the sealant has:

- a skin formation time of 5 min
- a gluing free time of 25 min
- an early stress after 280 min (not acceptable).

- a complete cure after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 25

Furthermore, the sealant was found to have good adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, etc.

However, the sealant has insufficient storage stability in the cartridge.

After only 4 weeks of storage at 60°C in the cartridge, the following parameters have deteriorated:

- no notch strength after 24 h in air
- Shore A hardness after 7 days in air only 17
- yellowing of the sealant

Comparative example 6:

Sealant formulation 1 (with oxime crosslinker)

A silicone rubber mass is prepared according to the following formulation:

525.0 g	α , ω -dihydroxyl-terminated polydimethylsiloxane with a viscosity of 80,000 cSt
313.0 g	polydimethylsiloxane with viscosity 100 cSt
103.0 g	highly dispersed silica (filler)
42.0 g	crosslinker mixture of
	21.0 g ethyl-tris(acetonoximo)silane,
	15.0 g vinyl-tris(ethylmethylketoximo)silane and
	6.0 g methyl-tris(ethylmethylketoximo)silane
13.0 g	adhesion promoter (based on aminoethyl aminopropyl trimethoxysilane)
4.0 g	bismuth tris(2-ethylhexanoate)

After application in air, the sealant has:

- a skin formation time of 5 min
- a gluing free time of 15 min
- an early stress after 300 min (not acceptable).
- a complete cure after 24 h (notch strength)
- a transparent appearance

- a Shore A hardness of 25

Furthermore, the sealant was found to have good adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, etc.

However, the sealant has insufficient storage stability in the cartridge.

After only 4 weeks of storage at 60°C in the cartridge, the following parameters have deteriorated:

- no notch strength after 24 h in air
- Shore A hardness after 7 days in air only 15
- yellowing of the sealant

Comparative example 7:

Sealant formulation 1 (with oxime crosslinker)

A silicone rubber mass is prepared according to the following formulation:

525.0 g	α , ω -dihydroxyl-terminated polydimethylsiloxane with a viscosity of 80,000 cSt
313.0 g	polydimethylsiloxane with viscosity 100 cSt
103.0 g	highly dispersed silica (filler)
42.0 g	crosslinker mixture of
	21.0 g ethyl-tris(acetonoximo)silane,
	15.0 g vinyl-tris(ethylmethylketoximo)silane and
	6.0 g methyl-tris(ethylmethylketoximo)silane
13.0 g	adhesion promoter (based on aminoethyl aminopropyl trimethoxysilane)
4.0 g	calcium bis(2-ethylhexanoate)

After application in air, the sealant has:

- a skin formation time of 5 min
- a gluing free time of 18 min
- an early stress after 320 min (not acceptable).
- a complete cure after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 25

Furthermore, the sealant was found to have good adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, etc.

However, the sealant has insufficient storage stability in the cartridge.

After only 4 weeks of storage at 60°C in the cartridge, the following parameters have deteriorated:

- no notch strength after 24 h in air
- Shore A hardness after 7 days in air only 14
- yellowing of the sealant

Comparative example 8:

Sealant formulation 2 (with oxime crosslinker)

A silicone rubber mass is prepared according to the following formulation:

525.0 g	α , ω -dihydroxyl-terminated polydimethylsiloxane with a viscosity of 80,000 cSt
313.0 g	polydimethylsiloxane with viscosity 100 cSt
103.0 g	highly dispersed silica (filler)
42.0 g	crosslinker mixture of
	21.0 g vinyl-tris(ethylmethylketoximo)silane and
	21.0 g methyl-tris(ethylmethylketoximo)silane
13.0 g	adhesion promoter (based on aminoethyl aminopropyl trimethoxysilane)
2.0 g	sodium (2-ethylhexanoate)

After application in air, the sealant has:

- a skin formation time of 8 min
- a gluing free time of 30 min
- a complete cure after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 23

Furthermore, the sealant was found to have good adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, etc.

However, the sealant has insufficient storage stability in the cartridge.

After only 4 weeks of storage at 60°C in the cartridge, the following parameters have deteriorated:

- insufficient liability
- Shore A hardness after 7 days in air only 5

It is evident from Comparative Examples 1 to 8 that it is not possible to use the known tin-free catalysts to produce a sealant compound with oxime crosslinkers that exhibits good product properties comparable to those of a conventional tin-containing sealant compound (e.g. Reference Example 1). In particular, the sealants produced with the known tin-free catalysts exhibit poor adhesion to many materials and insufficient storage stability.

Example 3:

Sealant formulation 1 (with oxime crosslinker)

A silicone rubber mass is prepared according to the following formulation:

525.0 g	α , ω -dihydroxyl-terminated polydimethylsiloxane with a viscosity of 80,000 cSt
313.0 g	polydimethylsiloxane with viscosity 100 cSt
103.0 g	highly dispersed silica (filler)
42.0 g	crosslinker mixture of
	21.0 g ethyl-tris(ethylmethylketoximo)silane,
	15.0 g vinyl-tris(ethylmethylketoximo)silane and
	6.0 g methyl-tris(ethylmethylketoximo)silane
13.0 g	adhesion promoter (based on aminoethyl aminopropyl trimethoxysilane)
2.0 g	catalyst A (from example 1)

After application in air, the sealant has:

- a skin formation time of 12 min
- a gluing free time of 23 min
- an early stress after 180 min
- a complete cure after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 25

Furthermore, the sealant was found to have good adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, and many other materials.

Furthermore, the sealant is characterized by its excellent storage stability in the cartridge. After 4 weeks of storage at 60°C in the cartridge, the sealant still exhibits the same properties as when it was first applied.

Example 4:

Sealant formulation 2 (with oxime crosslinker)

A silicone rubber mass is prepared according to the following formulation:

525.0 g	α , ω -dihydroxyl-terminated polydimethylsiloxane with a viscosity of 80,000 cSt
313.0 g	polydimethylsiloxane with viscosity 100 cSt
103.0 g	highly dispersed silica (filler)
42.0 g	crosslinker mixture of
	21.0 g vinyl-tris(ethylmethylketoximo)silane and
	21.0 g methyl-tris(ethylmethylketoximo)silane
13.0 g	adhesion promoter (based on aminoethyl aminopropyl trimethoxysilane)
2.0 g	catalyst A (from example 1)

After application in air, the sealant has:

- a skin formation time of 10 min
- a gluing free time of 20 min
- an early stress after 140 min
- a complete cure after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 26

Furthermore, the sealant was found to have good adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, and many other materials.

Furthermore, the sealant is characterized by its excellent storage stability in the cartridge. After 4 weeks of storage at 60°C in the cartridge, the sealant still exhibits the same properties as when it was first applied.

Example 5:Sealant formulation 2 (with oxime crosslinker)

Three exemplary catalysts (A1 to A3) are prepared from calcium bis(2-ethylhexanoate) and zinc bis(2-ethylhexanoate). The mixing ratio (weight ratio) of calcium bis(2-ethylhexanoate) to zinc bis(2-ethylhexanoate) is 1:1 in catalyst A1, 2:3 in catalyst A2, and 1:3 in catalyst A3.

A silicone rubber mass is prepared according to the formulation described in Example 4, wherein 2.0 g of each of catalysts A1, A2, and A3 is added in place of 2.0 g of catalyst A.

After application in air, the sealant has:

- a skin formation time of 6 min (A1, A2, A3)
- a gluing time of 30 min (A1) or 25 min (A2, A3)
- a complete cure after 24 h (A1, A2, A3)
(notch strength)
- a transparent appearance
- a Shore A hardness of 24 (A1) and 26 (A2, A3) respectively

Furthermore, the sealant was found to have good adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, and many other materials.

Furthermore, the sealant is characterized by its excellent storage stability in the cartridge. After 4 weeks of storage at 60°C in the cartridge, the sealant still exhibits the same properties as when it was first applied.

Example 6:Sealant formulation 2 (with oxime crosslinker)

Three exemplary catalysts (C1 to C3) are prepared from sodium (2-ethylhexanoate) and zinc bis(2-ethylhexanoate). Here, the mixing ratio (weight ratio) of sodium (2-ethylhexanoate) to zinc bis(2-ethylhexanoate) is 4:1 in catalyst C1, 2:3 in catalyst C2, and 1:4 in catalyst C3.

A silicone rubber mass is prepared according to the formulation described in Example 4, wherein 2.0 g of each of catalysts C1, C2, and C3 is added in place of 2.0 g of catalyst A.

After application in air, the sealant has:

- a skin formation time of 6 min (C1, C3) and 7 min (C2) respectively
- a bonding time of 25 min (C1, C2, C3)
- a complete cure (notch strength) after 24 h (C1, C2, C3)
- a transparent appearance
- a Shore A hardness of 24 (C1) or 25 (C2, C3)

Furthermore, the sealant was found to have good adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, and many other materials.

Example 7:

Sealant formulation 2 (with oxime crosslinker)

A silicone rubber mass is prepared according to the formulation described in Example 4, using 2.0 g of a catalyst consisting of potassium-(2-ethylhexanoate) and zinc bis(2-ethylhexanoate) in a ratio of 2:3 instead of 2.0 g of Catalyst A.

After application in air, the sealant has:

- a skin formation time of 6 min
- a gluing free time of 25 min
- a complete cure after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 25

Furthermore, the sealant was found to have good adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, and many other materials.

Example 8:Sealant formulation 2 (with oxime crosslinker)

A silicone rubber mass is prepared according to the formulation described in Example 4, wherein instead of 2.0 g of Catalyst A, 2.0 g of a catalyst consisting of lithium-(2-ethylhexanoate) and zinc bis(2-ethylhexanoate) in a ratio of 2:3 is used.

After application in air, the sealant has:

- a skin formation time of 7 min
- a gluing free time of 25 min
- a complete cure after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 25

Furthermore, the sealant was found to have good adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, and many other materials.

In contrast to the sealants produced in Comparative Examples 1 to 8, the sealants with oxime crosslinkers produced with the catalyst according to the invention are characterized not only by excellent product properties but also by excellent storage stability. The advantageous effect of the catalyst according to the invention is independent of the composition used, the mixing ratio and the crosslinkers used. A particularly advantageous catalyst comprises calcium bis(2-ethylhexanoate) and zinc bis(2-ethylhexanoate). In particular, catalyst A was found to produce particularly good properties in the sealants produced, especially in combination with oxime crosslinkers. Also, an additional co-catalyst is not required.

Comparative example 9:Sealant formulation 3 (with acetate crosslinker)

A silicone rubber mass is prepared according to the following formulation:

562.0 g	α , ω -dihydroxyl-terminated polydimethylsiloxane with a viscosity of 80,000 cSt
313.0 g	polydimethylsiloxane with viscosity 100 cSt
79.0 g	highly dispersed silica (filler)
40.0 g	crosslinker mixture of
	28.0 g propyl-triacetoxysilane and
	12.0 g ethyl-triacetoxysilane
5.0 g	adhesion promoter (diacetox-di-tert-butoxysilane)
2.9 g	zinc bis(2-ethylhexanoate)
1,1 g	octylphosphonic acid (co-catalyst)

After application in air, the sealant has:

- a skin formation time of 11 min
- a gluing free time of 75 min
- an early stress after 30 min
- a complete cure after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 23

Furthermore, the sealant was found to have good adhesion to wood, painted wood, glazed wood, aluminum, glass, polyamide, steel, etc.

However, the sealant has insufficient storage stability in the cartridge.

After only 8 weeks of storage at room temperature in the cartridge, the following parameters have deteriorated:

- bonding time: 420 min
- no notch strength after 24 h in air
- an early stress after 90 min

Comparative example 10:

Sealant formulation 3 (with acetate crosslinker)

A silicone rubber mass is prepared according to the following formulation:

562.0 g	α , ω -dihydroxyl-terminated polydimethylsiloxane with a viscosity of 80,000 cSt
313.0 g	polydimethylsiloxane with viscosity 100 cSt
79.0 g	highly dispersed silica (filler)
40.0 g	crosslinker mixture of
	28.0 g propyl-triacetoxysilane and
	12.0 g ethyl-triacetoxysilane
5.0 g	adhesion promoter (diacetoxo-di-tert-butoxysilane)
4.0 g	zinc bis(2-ethylhexanoate)

After application in air, the sealant has:

- a skin formation time of 11 min
- a bonding time of more than five hours
- an early exposure after more than five hours
- no complete curing after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 22

Furthermore, the sealant was found to have good adhesion to aluminum, glass, polyamide, steel, etc.

In contrast, adhesion to wood, painted wood and glazed wood is poor.

The sealant also exhibits insufficient storage stability in the cartridge.

After only 4 weeks of storage at 60°C in the cartridge, the following parameters have deteriorated:

- bonding time: more than 48 hours
- no notch strength after 48 h in air
- an early exposure after more than 48 h
- Shore A hardness after 7 days in air only 15

Comparative example 11:

Sealant formulation 3 (with acetate crosslinker)

A silicone rubber mass is prepared according to the following formulation:

562.0 g	α , ω -dihydroxyl-terminated polydimethylsiloxane with a viscosity of 80,000 cSt
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313.0 g	polydimethylsiloxane with viscosity 100 cSt
79.0 g	highly dispersed silica (filler)
40.0 g	crosslinker mixture of
	28.0 g propyl-triacetoxysilane and
	12.0 g ethyl-triacetoxysilane
5.0 g	adhesion promoter (diacetox-di-tert-butoxysilane)
4.0 g	bismuth tris(2-ethylhexanoate)

After application in air, the sealant has:

- a skin formation time of 7 min
- a bonding time of more than 5 hours
- an early exposure after more than 5 hours
- no complete curing after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 21

Furthermore, the sealant was found to have good adhesion to aluminum, glass, polyamide, steel, etc.

In contrast, adhesion to wood, painted wood and glazed wood is poor.

The sealant also exhibits insufficient storage stability in the cartridge.

After only 4 weeks of storage at 60°C in the cartridge, the following parameters have deteriorated:

- bonding time: more than 48 hours
- no notch strength after 48 h in air
- an early exposure after more than 48 h
- Shore A hardness after 7 days in air only 14

Comparative example 12:

Sealant formulation 3 (with acetate crosslinker)

A silicone rubber mass is prepared according to the following formulation:

562.0 g	α , ω -dihydroxyl-terminated polydimethylsiloxane with a viscosity of 80,000 cSt
313.0 g	polydimethylsiloxane with viscosity 100 cSt

79.0 g	highly dispersed silica (filler)
40.0 g	crosslinker mixture of
	28.0 g propyl-triacetoxysilane and
	12.0 g ethyl-triacetoxysilane
5.0 g	adhesion promoter (diacetoxo-di-tert-butoxysilane)
4.0 g	calcium bis(2-ethylhexanoate)

After application in air, the sealant has:

- a skin formation time of 9 min
- a bonding time of more than 5 hours
- an early exposure after more than 5 hours
- no complete curing after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 23

Furthermore, the sealant was found to have good adhesion to aluminum, glass, polyamide, steel, etc.

In contrast, adhesion to wood, painted wood and glazed wood is poor.

The sealant also exhibits insufficient storage stability in the cartridge.

After only 4 weeks of storage at 60°C in the cartridge, the following parameters have deteriorated:

- bonding time: more than 48 hours
- no notch strength after 48 h in air
- an early exposure after more than 48 h
- Shore A hardness after 7 days in air only 12

Comparative example 13:

Sealant formulation 4 (with acetate and alkoxy crosslinker)

A silicone rubber mass is prepared according to the following formulation:

555.0 g	α , ω -dihydroxyl-terminated polydimethylsiloxane with a viscosity of 80,000 cSt
312.0 g	polydimethylsiloxane with viscosity 100 cSt
84.0 g	highly dispersed silica (filler)

45.0 g	crosslinker mixture of
	31.5 g methyl triacetoxysilane,
	9.0 g propyl triacetoxysilane and
	4.5 g methyl trimethoxysilane
2.5 g	adhesion promoter (diacetoxo-di-tert-butoxysilane)
4.0 g	lithium (2-ethylhexanoate)

After application in air, the sealant has:

- a skin formation time of 6 min
- a gluing free time of 30 min
- a complete cure after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 16

Furthermore, the sealant was found to have only moderate adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, and many other materials.

The sealant also exhibits insufficient storage stability in the cartridge.

After only 4 weeks of storage at 60°C in the cartridge, complete curing no longer occurs. Accordingly, no adhesion to substrates is observed.

Comparative example 14:

Sealant formulation 4 (with acetate and alkoxy crosslinker)

A silicone rubber mass is prepared according to the formulation described in Comparative Example 13, wherein 4.0 g of sodium (2-ethylhexanoate) is used as catalyst instead of 4.0 g of lithium (2-ethylhexanoate).

After application in air, the sealant has:

- a skin formation time of 6 min
- a bonding time of 28 min
- a complete cure after 24 h (notch strength)
- a transparent appearance

- a Shore A hardness of 1

Furthermore, the sealant was found to have only moderate adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, and many other materials.

The sealant also exhibits insufficient storage stability in the cartridge.

After only 4 weeks of storage at 60°C in the cartridge, complete curing no longer occurs. Accordingly, no adhesion to substrates is observed.

Comparative example 15:

Sealant formulation 4 (with acetate and alkoxy crosslinker)

A silicone rubber mass is prepared according to the formulation described in Comparative Example 13, wherein 4.0 g of potassium (2-ethylhexanoate) is used as catalyst instead of 4.0 g of lithium (2-ethylhexanoate).

After application in air, the sealant has:

- a skin formation time of 5 min
- a gluing free time of 30 min
- a complete cure after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 16

Furthermore, the sealant was found to have only moderate adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, and many other materials.

The sealant also exhibits insufficient storage stability in the cartridge.

After only 4 weeks of storage at 60°C in the cartridge, complete curing no longer occurs. Accordingly, no adhesion to substrates is observed.

It is evident from Comparative Examples 9 to 15 that it is not possible to use the known tin-free catalysts to produce a sealant composition with acetate crosslinkers that exhibits good product properties comparable to those of a conventional tin-containing sealant composition (e.g. Reference Example 1). In particular, the sealants prepared with the known tin-free catalysts exhibit poor adhesion to many materials as well as poor through-curing. In addition, these sealants exhibit insufficient storage stability.

Example 9:

Sealant formulation 3 (with acetate crosslinker)

A silicone rubber mass is prepared according to the following formulation:

562.0 g	α , ω -dihydroxyl-terminated polydimethylsiloxane with a viscosity of 80,000 cSt
313.0 g	polydimethylsiloxane with viscosity 100 cSt
79.0 g	highly dispersed silica (filler)
40.0 g	crosslinker mixture of
	28.0 g propyl-triacetoxysilane and
	12.0 g methyl-triacetoxysilane
5.0 g	adhesion promoter (diacetox-di-tert-butoxysilane)
4.0 g	catalyst B (from example 2)

After application in air, the sealant has:

- a skin formation time of 12 min
- a gluing free time of 25 min
- an early stress after 40 min
- a complete cure after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 15

Furthermore, the sealant was found to have good adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, and many other materials.

Furthermore, the sealant is characterized by its excellent storage stability in the cartridge. After 8 weeks of storage at 60°C in the cartridge, the sealant still exhibits the same properties as when it was first applied.

Example 10:

Sealant formulation 4 (with acetate and alkoxy crosslinker)

A silicone rubber mass is prepared according to the following formulation:

555.0 g	α , ω -dihydroxyl-terminated polydimethylsiloxane with a viscosity of 80,000 cSt
312.0 g	polydimethylsiloxane with viscosity 100 cSt
84.0 g	highly dispersed silica (filler)
45.0 g	crosslinker mixture of
	31.5 g methyl triacetoxysilane,
	9.0 g propyl triacetoxysilane and
	4.5 g methyl trimethoxysilane
2.5 g	adhesion promoter (diacetoxo-di-tert-butoxysilane)
4.0 g	catalyst B (from example 2)

After application in air, the sealant has:

- a skin formation time of 15 min
- a gluing free time of 27 min
- an early stress after 40 min
- a complete cure after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 20

Furthermore, the sealant was found to have good adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, and many other materials.

Furthermore, the sealant is characterized by its excellent storage stability in the cartridge. After 8 weeks of storage at 60°C in the cartridge, the sealant still exhibits the same properties as when it was first applied.

Example 11:Sealant formulation 4 (with acetate and alkoxy crosslinker)

Four exemplary catalysts (B1 to B4) are prepared from bismuth tris(2-ethylhexanoate) and zinc bis(2-ethylhexanoate). Here, the mixing ratio of bismuth tris(2-ethylhexanoate) to zinc bis(2-ethylhexanoate) is 4:1 in catalyst B1, 1:1 in catalyst B2, 2:1 in catalyst B3, and 1:4 in catalyst B4.

A silicone rubber mass is prepared according to the formulation described in Example 10, wherein 4.0 g of each of catalysts B1, B2, B3 and B4 is added in place of 4.0 g of catalyst B.

After application in air, the sealant has:

- a skin formation time of 8 min (B1, B2, B3, B4)
- a gluing time of 25 min (B1, B2, B3) resp. 45 min (B4)
- a complete cure after 24 h (notch strength)
(B1, B2, B3, B4)
- a transparent appearance
- a Shore A hardness of 20 (B2, B3, B4) or 21 (B1)

Furthermore, the sealant was found to have good adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, and many other materials.

Furthermore, the sealant is characterized by its excellent storage stability in the cartridge. After 8 weeks of storage at 60°C in the cartridge, the sealant still exhibits the same properties as when it was first applied.

Example 12:Sealant formulation 4 (with acetate and alkoxy crosslinker)

A silicone rubber mass is prepared according to the formulation described in Example 10, using 4.0 g of a catalyst consisting of bismuth-tris(2-ethylhexanoate) and sodium(2-ethylhexanoate) in a 2:1 ratio instead of 4.0 g of Catalyst B.

After application in air, the sealant has:

- a skin formation time of 6 min
- a gluing free time of 23 min
- a complete cure after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 17

Furthermore, the sealant was found to have good adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, and many other materials.

Example 13:

Sealant formulation 4 (with acetate and alkoxy crosslinker)

A silicone rubber mass is prepared according to the formulation described in Example 10, wherein 4.0 g of a catalyst consisting of bismuth-tris(2-ethylhexanoate-) and calcium bis(2-ethylhexanoate) in a ratio of 1:1 is used instead of 4.0 g of catalyst B.

After application in air, the sealant has:

- a skin formation time of 7 min
- a bonding time of 32 min
- a complete cure after 24 h (notch strength)
- a transparent appearance
- a Shore A hardness of 17

Furthermore, the sealant was found to have good adhesion to wood, painted wood, glazed wood, aluminum, powder-coated aluminum, glass, PVC, polyamide, steel, concrete, and many other materials.

In contrast to the sealants produced in Comparative Examples 9 to 15, the sealants produced with the catalyst according to the invention using acetate crosslinkers or acetate and alcoholate crosslinkers of Examples 9 to 13 are characterized not only by excellent product properties but

also by excellent storage stability. The advantageous effect of the catalyst according to the invention is independent of the composition used, the mixing ratio and the crosslinkers used. A particularly advantageous catalyst comprises bismuth tris(2-ethylhexanoate) and zinc bis(2-ethylhexanoate). In particular, catalyst B was found to produce particularly good properties in the sealants produced, especially in combination with acetate crosslinkers.

An additional co-catalyst is also not required.

P A T E N T K R A V

1. Sammensætning, omfattende
 - mindst én organosiliciumforbindelse,
 - mindst ét tværbindingsmiddel, og
- 5 en katalysator, hvor katalysatoren omfatter et metalsalt af en carboxylsyre som er et zinksalt af én eller flere forgrenede mættede carboxylsyrer med seks til nitten carbonatomer, og et metalsalt af en carboxylsyre som er valgt blandt et bismuthsalt, et calciumsalt, et kaliumsalt, et lithiumsalt, et magnesiumsalt og et natriumsalt, hver især af én eller flere forgrenede mættede carboxylsyrer med seks til nitten carbonatomer.
- 10 2. Sammensætning ifølge krav 1, k e n d e t e g n e t ved, at forholdet mellem antallet af zinkatomer af zinksaltet af en carboxylsyre og antallet af metalatomer af metalsaltet af en carboxylsyre er fra 2:1 til 1:2, fortrinsvis fra 1,3:1 til 1:1,3.
3. Sammensætning ifølge et af de foregående krav, k e n d e t e g n e t ved, at det omfatter calcium-bis(2-ethylhexanoat) og zink-bis(2-ethylhexanoat), fortrinsvis i et antalsmæssigt forhold fra 1,3:1 til 1:1,3, eller
- 15 k e n d e t e g n e t ved, at det omfatter bismuth-tris(2-ethylhexanoat) og zink-bis(2-ethylhexanoat), fortrinsvis i et antalsmæssigt forhold fra 1,3:1 til 1:1,3, eller
- k e n d e t e g n e t ved, at det omfatter natrium(2-ethylhexanoat) og zink-bis(2-ethylhexanoat), fortrinsvis i et antalsmæssigt forhold fra 1,3:1 til 1:1,3.
- 20 4. Sammensætning ifølge et af de foregående krav, k e n d e t e g n e t ved, at organosiliciumforbindelsen er en α , ω -dihydroxyl-termineret polyorganosiloxanforbindelse, især en α , ω -dihydroxyl-termineret polydialkylsiloxan.
5. Sammensætning ifølge et af de foregående krav, k e n d e t e g n e t ved, at tværbindingsmidlet omfatter mindst én forbindelse valgt fra gruppen bestående af silanfor-
- 25 bindelser som omfatter syrerester, især silanforbindelser med acetatrester, og silanforbindelser som omfatter oximrester, især silanforbindelser med acetonoxim-grupper, silanforbindelser med methyl-ethyl-ketoxim-grupper, silanforbindelser med methyl-propylketoxim-grupper, silanforbindelser med methyl-isobutyl-ketoxim-grupper og/eller silanforbindelser med methyl-isopropyl-ketoxim-grupper.
- 30 6. Sammensætning ifølge et af de foregående krav, k e n d e t e g n e t ved, at tværbindingsmidlet omfatter mindst én silanforbindelse med acetatrester og én silanforbindelse med alkoxyrester.
7. Sammensætning ifølge et af de foregående krav, k e n d e t e g n e t ved, at det omfatter 40 til 90 vægt-% af organosiliciumforbindelsen, 1 til 15 vægt-% af tværbin-
- 35 dingsmidlet og 0,1 til 5,0 vægt-% af katalysatoren ifølge et af kravene 1 til 10.
8. Anvendelse af en sammensætning ifølge et af de foregående krav til fremstilling af en silikonegummimasse, især til anvendelse som tætningsmiddel, klæbemiddel eller coating.
9. Anvendelse af en katalysator til tværbinding af en silikonegummimasse, hvor ka-
- 40 talysatoren omfatter et metalsalt af en carboxylsyre som er et zinksalt af én eller flere for-

grenede mættede carboxylsyrer med seks til nitten carbonatomer, og et metalsalt af en carboxylsyre som er valgt blandt et bismuthsalt, et calciumsalt, et kaliumsalt, et lithiumsalt, et magnesiumsalt og et natriumsalt, hver især af én eller flere forgrenede mættede carboxylsyrer med seks til nitten carbonatomer, k e n d e t e g n e t ved, at katalysatoren
5 omfatter calcium-bis(2-ethylhexanoat) og zink-bis(2-ethylhexanoat), fortrinsvis i et antalsmæssigt forhold fra 1,3:1 til 1:1,3, eller

k e n d e t e g n e t ved, at katalysatoren omfatter bismuth-tris(2-ethylhexanoat) og zink-bis(2-ethylhexanoat), fortrinsvis i et antalsmæssigt forhold fra 1,3:1 til 1:1,3, eller

k e n d e t e g n e t ved, at katalysatoren omfatter natrium(2-ethylhexanoat) og
10 zink-bis(2-ethylhexanoat), fortrinsvis i et antalsmæssigt forhold fra 1,3:1 til 1:1,3.

10. Anvendelse ifølge krav 9, k e n d e t e g n e t ved, at silikonegummimassen omfatter mindst én organosiliciumforbindelse som er en α , ω -dihydroxy-termineret polyorganosiloxanforbindelse, især en α , ω -dihydroxyl-termineret polydialkylsiloxan.

11. Anvendelse ifølge krav 9 eller 10, k e n d e t e g n e t ved, at silikonegummimassen omfatter mindst ét tværbindingsmiddel, hvor tværbindingsmidlet omfatter mindst
15 én forbindelse som er valgt fra gruppen bestående af silanforbindelser som omfatter syrerester, især silanforbindelser med acetatresten, og silanforbindelser som omfatter oximrester, især silanforbindelser med acetonoxim-grupper, silanforbindelser med methyl-ethylketoxim-grupper, silanforbindelser med methyl-propylketoxim-grupper, silanforbindelser
20 med methyl-isobutylketoxim-grupper og/eller silanforbindelser med methyl-isopropylketoxim-grupper.

12. Katalysator, omfattende

et metalsalt af en carboxylsyre som er et zinksalt af én eller flere forgrenede mættede carboxylsyrer med seks til nitten carbonatomer, og et metalsalt af en carboxylsyre
25 som er valgt blandt et bismuthsalt, et calciumsalt, et kaliumsalt, et lithiumsalt, et magnesiumsalt og et natriumsalt, hver især af én eller flere forgrenede mættede carboxylsyrer med seks til nitten carbonatomer.