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(R₂SiO)_n

wherein R is a saturated monovalent hydrocarbon radical, either substituted or unsubstituted, such as a methyl, ethyl, trifluoropropyl or phenyl group, and *n* is a positive integer, and (ii) vinyl siloxane units represented by the unit formula:



wherein R' is a saturated monovalent hydrocarbon radical, either substituted or unsubstituted, *m* is a positive integer, and whose molecular chains are terminated by a monovalent hydrocarbon radical, such as a hydroxyl, methyl, ethyl, trifluoropropyl, phenyl or vinyl group. These can be prepared by polymerizing, to the desired degree of polymerization, for example, a mixture of some cyclosiloxanes such as octamethyltetracyclosiloxane, hexamethyltricyclosiloxane, tetramethyltetra vinylcyclosiloxane, octaphenyltetracyclosiloxane, hexaphenyltricyclosiloxane, and tetramethyltetraphenylcyclosiloxane, in the present of an alkali or acid catalyst.

Component (a) is a main raw material used in the formation of the silicone sponge rubber of the invention. It contains in its molecule from 0.025 to 0.25 mole percent of vinyl-group containing siloxane units. Its viscosity must be at least 1,000,000 cs. at 25° C. so as not to reduce the strength of the silicone sponge rubber.

Component (b) which is of diorganopolysiloxane must contain in its molecule at least 10 times as many mole percent of vinyl-group-containing siloxane units as is contained in one molecule of component (a), but its degree of polymerization need not be very high. What is only required is that it have a viscosity of at least 10 cs. at 25° C.

Components (a) and (b) are mixed in the ratio of from 80 to 99 parts by weight of (a) to from 1 to 20 parts by weight of (b). If the mixture of the two components has too low a viscosity or has an extremely high viscosity, then the mixture of components (a) and (b) may not give a sponge rubber having the superior physical properties sought. Thus the viscosity of the mixture of the two components should be preferably kept in the range of from 1,000,000 to 50,000,000 cs. at 25° C.

The organohydrogen polysiloxane employed as component (c) contains, as mentioned above, at least three Si—H linkages in its molecule. Examples of such organohydrogen polysiloxanes include (i) methylhydrogen polysiloxanes, of various degrees of polymerization, whose molecular chains are terminated by trialkylsilyl group, (ii) tetrasiloxanes represented by:



(iii) siloxane copolymers consisting of SiO₂ unit and (CH₃)₂SiHO_{0.5} unit, and (iv) copolymers of methylhydrogen siloxane and dialkyl siloxane. These materials are readily prepared by known methods. The curing reaction, conducted by component (c) is an addition reaction between the Si—H linkage in component (c) and the vinyl group connected to the silicon atom in components (a) and (b). The organic group which is directly connected to the silicon atom of the Si—H linkage in the component should preferably be of a low molecular weight such as, for example, a methyl group.

If the amount of component (c) employed is too small, sufficient curing cannot be obtained. If it is too large, the tensile strength and heat resistance of the product are reduced. If the amount of component (c) is adequate, a more advantageously arranged bridging structure results. Taking this into consideration, it is recommended that the amount of Si—H linkages should be from 50 to 200 mole percent of the total amount of vinyl groups contained in components (a) and (b), or approximately from 0.1 to 10 parts by weight.

Silica filler used for the preparation of prior art silicone rubbers may be employed as component (d). Exam-

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ples of silica filler include finely divided silica such as fumed silica and silica aerogel. If the particle size of the silica is large, the mechanical strength of the silicone rubber obtained will be reduced. Thus the particle size must be fine enough so that the silica filler will have a surface area of at least 150 m.²/g. as measured by the nitrogen absorption method. The amount of such silica to be admixed with the above-given amounts of components (a) and (b) is from 20 to 100 parts by weight.

The blowing agent, which is called component (e) is employed for the purpose of preparing a foam rubber of the silicone composition, consisting of components (a), (b), (c), and (d). The blowing agent should be readily thermally decomposable to generate gas, or easily gasified, in the temperature range of from 100 to 400° C. at which temperature the curing is conducted. Blowing agents that are preferred are those which generate 10 volumes of gas per volume of blowing agent. These preferred blowing agents are exemplified by azobisisobutyronitrile, dinitrosopentamethylenetetramine, N,N' - dimethyldinitrosoterephthalamide, and diaminobenzene. From 1 to 10 parts by weight of blowing agent are added to the above-given amounts of components (a) and (b).

The platinum catalyst added as component (f) is utilized to cause the addition reaction, and also to make the foams formed in the cured product continuous. The platinum catalyst also serves to inhibit the retention in the product of the decomposed residue. The platinum catalyst is preferably selected from the group of soluble platinum compounds such as, for example, (a) chloroplatinic acid, (b) a complex of (i) chloroplatinic acid and (ii) ethylene, propylene, butadiene, cyclohexane, or the like, and (c) a complex of chloroplatinic acid and an alkylamine such as a salt of chloroplatinic acid-*n*-butylamine. Only a catalytic amount of the catalyst is required, viz, from 1 to 100 p.p.m. or so of the total weight of components (a) and (b).

The elastomeric compositions of the present invention are prepared by kneading, on a two-roll rubber mill, a kneader, or a Banbury mixer, mixtures of the above-given components (a), (b), (c), (d), (e), and (f). Other materials which can be optionally incorporated within the mixtures if required include for example a dispersing agent such as a low-molecular siloxane ester and silanol, e.g., diphenylsilanediol or diphenylmethyl silanol; a heat resistance improving agent such as iron oxide, cerium oxide or iron octoate; pigments; and a blowing assistant. In order to further improve the stability upon storage of the product, well-known organic phosphorus compounds or organic amines may be added. There is no required particular order in which the above-given components are to be mixed. However it is recommended that components (a), (b), and (d) be uniformly mixed first, and that components (c), (e), and (f) then be added to the mixture of (a), (b) and (d).

The compositions of the present invention are heated at a temperature of between 100 and 400° C., either under atmospheric pressure or under elevated pressure, for a period of from five minutes to five hours, preferably, from 10 minutes to 1 hour, and then, if necessary, at a temperature of between 150 and 250° C. for a period of from 1 to 24 hours to carry out a post curing. Elastic sponge rubbers possessing high tensile strength are obtained. In contrast to ordinary silicone sponge rubbers in whose preparation peroxides are usually employed as curing agents, no residue of the decomposed curing agents remains in the finished products produced by the method of the present invention. Silicone sponge rubbers prepared according to the present invention are superior in compression set, resilient elasticity, resistance to heat, cold, and steam, and electrical and flame retardant properties. Consequently they are very useful as insulating materials, toilet sponge puffs, and sponge filters. They are especially well-suited where high tensile strength is required.