United States Patent Office 3,697,473
Patented Oct. 10, 1972

3,697,473

COMPOSITION CURABLE THROUGH Si-H AND Si-CH EQUALS CH_2 WITH IMPROVED PROPERTIES

Keith E. Polmanteer, David N. Willing, and Thomas D. Talcott, Midland, Mich., assignors to Dow Corning Corporation, Midland, Mich.

No Drawing. Continuation-in-part of application Ser. No. 852,103, Aug. 21, 1969. This application Jan. 4, 1971, Ser. No. 103,830
Int. Cl. C08g *51/04*
U.S. Cl. 260—37 SB 20 Claims

ABSTRACT OF THE DISCLOSURE

A composition contains a polydiorganosiloxane having two vinyl radicals, a mixture of silicon compounds having silicon-bonded hydrogen atoms where one organosiloxane compound has two silicon-bonded hydrogen atoms and the other organosiloxane compound has three to ten silicon bonded hydrogen atoms. The composition is cured by a platinum catalyst. The cured composition has elastomeric properties.

This application is a continuation-in-part of application Ser. No. 852,103, filed Aug. 21, 1969, now abandoned.

This invention relates to a siloxane composition curable through Si-H and Si-CH=CH_2 to an elastomeric product.

Many articles of commerce based on organosilicon compounds are of the type that can be easily formed to a desired shape or applied to a desired area, after which the easily worked material is then cured to retain its desired configuration. For example, polyorganosiloxane elastomers are normally supplied as formable materials ranging from thin pastes to stiff plastic dough-like materials. These materials are shaped by processes such as molding and extruding, after which the article is converted to the rubbery state by curing, a process often called vulcanization when applied to an elastomer. The article then retains its desired shape, or if deformed, will seek to return to its vulcanized, or cured configuration.

The curing methods employed for organosilicon compositions can be placed into two classes. The first are those that occur spontaneously at room temperature, exemplified by the curing systems such as described in U.S. Pats. 2,833,742, 2,843,555, 2,902,467, 2,934,519 and 2,999,077. The second are those that require heat to activate the curing reaction, such as organic peroxides, and the various sulfur-type cures more commonly used in connection with organic rubber.

The organosilicon compositions which cure spontaneously at room temperature are, for the most part, low in viscosity so that they can be manually placed in the desired position for cure with a minimum of equipment. The room temperature vulcanizable compositions do not need to be heated for cure and thus can be used in places where controlled heating equipment is not practical. Consequently, the room temperature vulcanizable compositions are highly desirable materials. Since the room temperature vulcanizable compositions are usually low in viscosity, the molecular weights of the base polymers are

low. It is generally recognized in the silicone rubber art that low molecular weight base polymers provide overall lower physical properties compared with the higher molecular weight base polymers. Thus, the low viscosity room temperature vulcanizable silicone rubbers generally have lower physical properties than the peroxide cured silicone rubbers prepared from high molecular weight gums. For this reason, it has been difficult to achieve a curable silicone rubber composition which would be low in viscosity for easy handling and which would cure to a silicone rubber with physical properties comparable to the peroxide cured silicone rubbers.

The present invention overcomes this problem by providing a composition which uses low molecular weight base polymers and cures to a material with improved physical properties. This object and others will become apparent from the following detailed description of the invention.

This invention relates to a composition consisting essentially of (A) a polydiorganosiloxane having two vinyl radicals per molecule, no silicon atom having more than one vinyl radical bonded thereto, the remaining organic radicals being selected from the group consisting of methyl, ethyl, phenyl and 3,3,3-trifluoropropyl radicals, at least 50 percent of the organic radicals being methyl radicals, said polydiorganosiloxane molecules being terminated by triorganosiloxy groups, and said polydiorganosiloxane having a viscosity of from 100 to 10,000 inclusive centipoise at 25° C., (B) a mixture of silicon containing compounds having silicon-bonded hydrogen atoms, there being present of from 0.75 to 1.50 silicon-bonded hydrogen atoms per vinyl radical of (A), said mixture (B) consisting essentially of (1) an organosiloxane compound containing two silicon-bonded hydrogen atoms per molecule and the organic radicals being selected from the group consisting of alkyl radicals having from 1 to 12 carbon atoms inclusive, phenyl and 3,3,3-trifluoropropyl radicals, no silicon atom having bonded thereto more than one silicon-bonded hydrogen atom, said organosiloxane compound (1) having no more than 500 silicon atoms per molecule, and (2) an organosiloxane compound containing from 3 to 10 inclusive silicon-bonded hydrogen atoms per molecule and the organic radicals being selected from the group consisting of alkyl radicals having from 1 to 12 carbon atoms inclusive, phenyl and 3,3,3-trifluoropropyl radicals, no silicon atom having bonded thereto more than one silicon-bonded hydrogen atom, said organosiloxane compound (2) having no more than 75 silicon atoms per molecule, said mixture (B) being such that at least 10 percent of the silicon-bonded hydrogen atoms are derived from (1) and at least 10 percent of the silicon-bonded hydrogen atoms are derived from (2), (1) and (2) composing 100 weight percent of mixture (B).

The polydiorganosiloxane (A) has two vinyl radicals per molecule, only one vinyl radical is bonded to any one silicon atom, and the remaining organic radicals can be methyl, ethyl, phenyl or 3,3,3-trifluoropropyl radicals where at least 50 percent are methyl radicals. The polydiorganosiloxane (A) is terminated by triorganosiloxy groups. The polydiorganosiloxane has a viscosity of 100 to 10,000 inclusive cp. at 25° C., preferably 1000 to 5000 cp. at 25° C.