

silicones containing such groups, or with ethylenically unsaturated monomers, can be cured rapidly by exposure to UV light.

The  $\alpha$ -allylbenzoin ether-hydrolyzable silane adducts are also usable as photoinitiators and are considered part of the present invention.

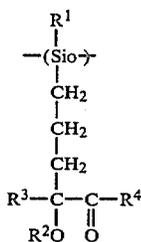
In comparison with the conventional photoinitiators, the polyphotoinitiators of the present invention offer the following advantages: lower expected toxicity because of lower volatility and lower permeability to skin; faster curing speed; better solubility in polyorganosiloxane compositions; and, in mixtures with unsaturated monomers, they form graft copolymers of polyorganosiloxane with improved low temperature flexibility, weatherability, insulating properties and impact strength.

In mixtures with unsaturated monomers or polymers, the products of the invention act as prepolymers since the polymer initiates a plurality of chains by addition to the vinyl group. They are thus especially useful in adhesive compositions where multiple simultaneous chain additions to the polysiloxane backbone can be used to produce an especially fast curing tough material. When used with adhesives, at least one of the substrates must be transparent.

The inventive products may also be used as ingredients of printing inks, photoresists, lithographics, and in coatings for plastics, wood, paper, etc. to produce protective films of weather resistance, and water repellancy.

#### DETAILED DESCRIPTION OF THE INVENTION

The polyorganosiloxane photoinitiators of the invention are organosiloxane polymers whose siloxane chains include a plurality of units of the formula:

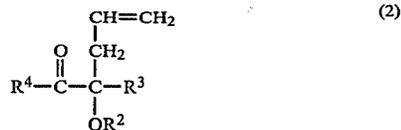


wherein  $\text{R}^1$  is alkyl, aryl, alkoxy, substituted alkyl or substituted aryl;  $\text{R}^2$  is alkyl, aryl, substituted alkyl or substituted aryl; and  $\text{R}^3$  and  $\text{R}^4$  are phenyl or substituted phenyl. Specific examples of  $\text{R}^1$  and  $\text{R}^2$  groups include methyl, phenyl, trifluoropropyl, ethyl and cyanopropyl. Phenyl substituents for the  $\text{R}^3$  and  $\text{R}^4$  groups could be alkyl, alkoxy, alkoxy, halide, alkaryl, cyanoalkyl, haloalkyl, and N,N-dialkylamino.

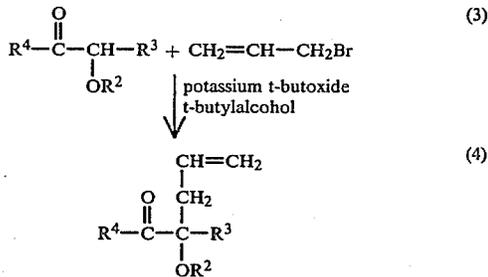
The polyorganosiloxane photoinitiators can be linear cyclic or branched and terminated with hydroxyl, alkoxy, acetoxy, trimethylsiloxy, etc., preferably trimethylsilyl. The siloxane chain is preferably between 20 and 2000 units long. The concentration of the photoinitiator repeating units of formula (1) in the polymer can range from 0.1 to 50%, preferably between 0.5 and 5%. Other organo groups which may be included on the siloxane backbone include olefinic radicals such as vinyl, propenyl and butenyl; alkyl; aryl; alkoxy; acrylates; cyanopropyl; mercaptopropyl and trifluoropropyl.

#### PREPARATION OF $\alpha$ -ALLYLBENZOIN ETHER

The analogues of  $\alpha$ -allylbenzoin ether have the following molecular structures, the R groups defined as above.



They may be prepared by a number of reactions including the following:



#### EXAMPLE I

Benzoïn ethyl ether (150 g) and t-butanol (750 g) were added into a two liter, three-necked, round-bottomed flask with magnetic stirring in an oil bath and heated to 50° C. to dissolve the benzoïn ethyl ether. The solution turned black after the addition of 73.7 g of potassium t-butoxide. Allyl bromide (92.4 g) was added slowly into the stirring solution at 80° C. The reaction was refluxed for 2 hours and allowed to cool down. After evaporation of the t-butanol and filtration of potassium bromide salt the crude product was subjected to distillation at 118° ± 2° C. and 0.05 mm Hg to obtain 158 g of allylbenzoïn ethyl ether which crystallized upon cooling.

#### EXAMPLE II

Benzoïn methyl ether (50 g) and t-butanol (500 g) were added to a 1 liter, 3neck, round bottom flask equipped with magnetic stirrer, and placed in an oil bath at 80° C. To this mixture, 33.7 g of potassium t-butoxide was added and the solution stirred for 15 minutes. Allyl Bromide (42.3 g) was added dropwise over a 1 hour period and stirring was continued at 85° C. for 2 more hours then cooled to room temperature. After evaporation of t-butanol and filtration of potassium bromide, the product was distilled at 125° C. ± 2° C. and 0.05 mmHg to yield 49.2 g of allylbenzoïn methyl ether which crystallized upon cooling.

The allylbenzoïn ethers may also be prepared by the reaction of the appropriate benzoïn ether with aqueous NaOH and allyl bromide in dimethylsulfoxide

