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PREPOLYMER COMPOSITION FOR INSULATING FOAMS
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- (57) Claim

1. A prepolymer composition for producing polyurethane insulating foams from pressure tanks which consists of a prepolymer component with at least one PU prepolymer with a content of NCO groups of 4 to 20 wt% and usual additives, as well as a propellant component, said composition comprising 0.01 to 2 wt%. based on the prepolymer component, of polybutadiene or copolymers of 1,3-polybutadiene with up to 50 mol% of other dienes or vinylaromatic compounds, the polybutadiene or copolymer having a molecular weight of 1,000 to 9,000.

6. The prepolymer composition of any one of claims 1 to 5, comprising 5 to 40% by weight of the propellant component.

7. The prepolymer composition of any one of claims 1 to 6, wherein the propellant component contains propane, butane and/or dimethylether.

8. The prepolymer composition of any one of claims 1 to 6, wherein the propellant component contains fluorocarbon.

16. A pressure can for discharging 1C polyurethane insulating foams comprising the prepolymer composition of any one of claims 1 to 14.



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(54) Title: PREPOLYMER COMPOSITION FOR INSULATING FOAMS
(54) Bezeichnung: PREPOLYMERZUSAMMENSETZUNG FÜR DÄMMSCHÄUME
(57) Abstract
A prepolymer composition for preparing polyurethane insulating foams from pressurized containers consists of a prepolymer component with at least one polyurethane prepolymer containing 4-20 % by weight of NCO groups, and commonly used additives, as well as a propellant gas, with 0.01 to 2 % by weight of polybutadiene based on the weight of the prepolymer component.
(57) Zusammenfassung
Prepolymerzusammensetzung zur Erzeugung von Polyurethandämmschäumen aus Druckbehältern, welche aus einer Prepolymerkomponente mit wenigstens einem PU-Prepolymer mit einem Gehalt an NCO-Gruppen von 4 bis 20 Gew.-% und üblichen Zusatzstoffen, sowie einer Treibgaskomponente besteht, mit einem Gehalt von 0,01 bis 2 Gew.-%, bezogen auf die Prepolymerkomponente, an Polybutadien.

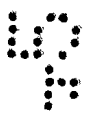
Description

This invention relates to a prepolymer composition for producing polyurethane insulating foams from pressure tanks
5 which consists of a prepolymer component with at least one PU prepolymer with a content of NCO groups of 4 to 20 wt% and usual additives as well as a propellant component. The invention furthermore relates to the use of polybutadiene as an additive to prepolymer compositions for producing 1C and 2C
10 polyurethane insulating foams for controlling cell opening and dimensional stability, as well as to pressure cans with such a prepolymer composition and optionally a separate polyol component for producing 1C and 2C polyurethane insulating foams.

15 The inventive prepolymer composition is used for producing polyurethane insulating foams which are used particularly for insulating purposes by foaming in cavities. The main areas of application are the construction industry, but also technical products in which cavities must be filled to avoid
20 condensation nests. When one-component polyurethane foams are spoken of, these are applied by discharging the prepolymer composition from pressure tanks, for example aerosol cans, on the spot with the help of propellants with a bulk density of 10 to 50 g/l, and processed. 1C foams are moisture-hardening,
25 i.e. they can be cured solely with the help of the moisture contained in the air and substrate moisture.

Two-component polyurethane foams require a second hydroxy component for curing the prepolymer composition, generally a polyol which must be added directly before foam formation.
30 Curing can be accelerated by catalysts. Bulk densities in 2C foams are characteristically 10 to 100 g/l.

Transitional forms between 1C and 2C foams are possible. In this case a quantity of a hydroxyl component insufficient for reacting the isocyanate groups is added to the prepolymer
35 before discharge. The invention also covers such "1.5C foams", as well as foams which are produced with more than



one separately added component.

Conventional prepolymer compositions for 1C and 2C polyurethane insulating foams contain a prepolymer component having a minimum content of reactive NCO groups. The prepolymer itself is a polymer of suitable viscosity with terminal NCO groups. The composition contains a certain quantity of monomeric isocyanate. Suitable isocyanates are for example isophorone diisocyanate, referred to as IPDI, tolylene diisocyanate, also referred to as TDI, diisocyanatotoluene, 1,5- diisocyanatonaphthalene, referred to as NDI, triisocyanato- trimethylmethane, 1,6-diisocyanatohexane, referred to as HDI, or 4,4-diisocyanatodiphenylmethane in a raw and pure form or as a mixture. An especially common one is 4,4-diisocyanatodi- phenylmethane, also referred to as MDI, which is used both in a raw form (raw MDI) and in the form of pure 2,4- and 4,4- isomers or mixtures thereof. One can likewise use the two common TDI isomers alone or in a mixture. For producing the prepolymer component one reacts such isocyanates with hydroxy polyethers, polyesters or polyvalent alcohols, making sure the prepolymer acquires a viscosity suitable for the composition.

As mentioned above, PU prepolymers suitable for producing polyurethane insulating foams from pressure tanks contain a residual content of unreacted monomeric isocyanate which can be up to 40%. This residual content is usually due to manufacturing, but is also desirable since it has turned out that this residual content has a positive effect on the serviceability, in particular the inherent and dimensional stability, of the produced foams. On the other hand monomeric isocyanates are deemed dangerous substances subject to identification because of their toxicity, despite their generally rather low volatility. MDI, the preferred initial isocyanate for 1C foams, is subject to a maximum working place concentration of 500 ppm. Because of the toxicity of the contained substances packings having residues of these prepolymers are subject to cost-intensive restrictions on disposal.



Although it is possible to produce low-monomer or substantially monomer-free prepolymers with low residual monomer contents, the low serviceability, in particular shrinkage behavior, of the produced foams has prevented the use of such prepolymer compositions up to now. Low-monomer prepolymers can be produced for example by
5 removal of the monomer through distillation and optionally further reaction with a reactive hydroxy polyether and/or polyester and/or vegetable oil, modified or unmodified.

In view of the disadvantages of known PU prepolymers containing monomeric isocyanate it is desirable to provide a PU prepolymer containing less monomeric isocyanate than up to now while guaranteeing the dimensional stability of foam demanded
10 particularly by the construction industry. It is in particular the goal of the invention to provide a prepolymer composition for dimensionally stable 1C and 2C PU foams which contains toxic and/or irritant components in quantities so low that they are no longer subject to identification.

In addition there is a need for additives promoting the dimensional stability of
15 insulating foams to be used for monomer-containing as well as low-monomer and monomer-free prepolymers.

This goal is achieved with a prepolymer composition of the abovementioned type which has a content of 0.01 to 2 wt%, based on the prepolymer component, of polybutadiene or copolymers of 1,3-butadiene with up to 50 mol% of other dienes or
20 vinylaromatic compounds, the polybutadiene or copolymer having a molecular weight of 1,000 to 9,000.

According to a first embodiment of the invention there is provided a prepolymer composition for producing polyurethane insulating foams from pressure tanks which consists of a prepolymer component with at least one PU prepolymer with a content of
25 NCO groups of 4 to 20 wt% and usual additives, as well as a propellant component, said composition comprising 0.01 to 2 wt%, based on the prepolymer component, of polybutadiene or copolymers of 1,3-polybutadiene with up to 50 mol% of other dienes or vinylaromatic compounds, the polybutadiene or copolymer having a molecular weight of 1,000 to 9,000.

According to a second embodiment of the invention there is provided a 1C or 2C
30 polyurethane insulating foam for controlling cell opening and dimensional stability, comprising a prepolymer composition of the first embodiment.

According to a third embodiment of the invention there is provided a pressure can for discharging 1C polyurethane insulating foams comprising the prepolymer composition
35 of the first embodiment.

According to a fourth embodiment of the invention there is provided a pressure can for discharging 1.5C and 2C polyurethane insulating foams with the prepolymer composition of the first embodiment and at least one separate component for curing the prepolymer composition.



The addition of a low quantity of polybutadiene makes it possible to improve the dimensional behavior of low-monomer PU prepolymers and obtain a fully foamable, substantially dimensionally stable and fully serviceable insulating material. Polybutadiene can be used in combination with PU prepolymers from all usual isocyanates, but is especially advantageous in combination with PU prepolymers based on HDI and MDI.

Suitable polybutadienes to be used are particularly liquid products as are offered by Hüls AG with a viscosity of at least 500 mPa.s at 20°C. Viscosity is preferably at least 2000 mPa.s at 20°C and in particular about 3000 mPa.s at 20°C. An especially suitable liquid polybutadiene is sold under the designation Polyöl 130 with about 75% 1,4-cis double bonds, about 24% 1,4-trans double bonds and about 1% vinyl double bonds and a molecular weight (vapor-pressure osmotic) of about 3000. The content of liquid polybutadiene according to the invention is 0.01 to 2 wt% and preferably 0.05 to 1 wt%, based on the prepolymer component to which it is added.

Suitable polybutadienes are furthermore those products of higher molecular weight which can be added to the prepolymer composition in a dissolved form or be dissolved therein. Also one can use higher-molecular polymeric hydrocarbons containing double bonds.

The molecular weight of suitable stabilizing additives is 1000 to 9000, in particular up to 5000.

Along with pure (liquid) polybutadiene one can also use copolymers of 1,3-butadiene with other 1,3-dienes, for example isoprene, 2,3-dimethylbutadiene and piperylene, and with vinylaromatic compounds such as styrene, α -methylstyrene, vinyl toluene and divinylbenzene. The content of comonomers in the copolymers should not exceed 50 mol%. Such copolymers are regarded as falling within the designation "(liquid) polybutadiene" if they are liquid or soluble.

It is assumed that the dimensionally stabilizing effect of polybutadiene is based on its ability to crosslink in the presence of oxygen.

For producing the inventively applied prepolymer composition one uses conventional aliphatic and aromatic polyisocyanates. In particular one uses polyfunctional isocyanates with a mean of 2 to 4 isocyanate groups both in monomeric and in oligomeric form. As stated at the outset, these prepolymer compositions are themselves reaction products from monomers or oligomers containing isocyanate groups, and components reactive therewith, in particular hydroxyfunctional compounds. As initial polyisocyanates one can use the abovementioned ones as well as those stated for example in DE-A-42 15 647.



Especially suitable isocyanate prepolymers for these prepolymer compositions are ones based on HDI, trimerized TDI, NDI, 4,4'-dicyclohexylmethanediisocyanate and IPDI, which can be converted especially easily to low-monomer or substantially monomer-free prepolymers. It is pointed out once again, however, that the particular effect of promoted dimensional stability occurs not only in combination with low-monomer or substantially monomer-free prepolymers but also with usual prepolymer compositions with high monomer contents.

The NCO content in the applied prepolymer component is between 4 and 20 wt%, preferably between 6 and 18 wt% and in particular between 7 and 13 wt%.

When producing the isocyanate prepolymers one uses usual hydroxy components, for example polyether, polyester or modified vegetable oils with a sufficient hydroxyl number, approximately in the range of 100 to 300. Castor oil with a hydroxyl number of about 160 is suitable, as are usual glycols, in particular polyethylene glycols.

The monomer-reduced prepolymer itself is obtainable for example by removing the monomer in a thin-layer evaporator. Alternatively or additionally one can react (residual) isocyanate monomer with a hydroxy polyether and/or polyester and/or modified vegetable oil. Suitable vegetable oils are ones with a hydroxyl number of 100 to 300, for example castor oil with a hydroxyl number of about 160. According to the invention it is readily possible to obtain stable foams with such monomer-reduced prepolymer components, provided the polybutadiene is added. A prepolymer composition is termed low-monomer if it has less than 10% monomer, in particular less than 5% monomer; and substantially monomer-free if it has less than 2, preferably less than 1 and in particular less than 0.5 wt% monomer, always based on the prepolymer component, i.e. the reactive isocyanate-containing component present in the composition.

Suitable initial prepolymers for inventive 1C and 2C



foams based on MDI are available for example from Bayer under the designations Desmodur E21, E23, VP LS 2905 and VP LS 2924, which are already relatively low-monomer. These materials have up to now found no acceptance in prepolymer compositions for insulating foams from pressure cans according to TRG 300.

5 Initial prepolymers also suitable for inventive 1C and 2C foams have proved to be ones based on HDI, as offered for example by Bayer under the designations Desmodur DA and N 3400. These have a residual content of monomeric HDI of less than 0.5 wt%. Desmodur N 3400 is a dimeric HDI. These materials have not been applied in pressure-can foam production up to now either.

10 The prepolymer can contain usual additives, for example polysiloxanes for cell regulation, flame proofing agents, softeners, catalysts, viscosity regulators, dyes, rheology-controlling additives and the like. The prepolymer composition, i.e. the PU prepolymer including all additives without propellants, generally has an initial service viscosity at 20°C of 5000 to 20000 mPa.s and preferably of 8000 to 15000 mPa.s.

15 Throughout the specification and claims the terminology "initial service viscosity" is to be taken as meaning the viscosity of the prepolymer composition without propellant at the time of its service or its expulsion from a pressurised can. According to the invention the content of NCO groups in the PU prepolymer is 4 to 20 wt%, preferably 6 to 18 wt% and in particular 7 to 13 wt%, based on the prepolymer.

20 The inventive prepolymer composition contains in particular propane, butane and/or dimethylether as a propellant component. Further propellants that can be used in the component are fluorocarbons which are liquefiable under the pressure conditions prevailing in a pressure tank, for example R 125 (pentafluoroethane), R 134a (non-symmetrical tetrafluoroethane), R 143 (trifluoroethane) and R 152a (non-symmetrical
25 difluoroethane). To minimize the content of combustible and halogen-containing propellants one can add further gases which are not condensable under the pressure conditions prevailing in the pressure can, for example CO₂, N₂O or N₂. CO₂ is particularly preferred since it can partly dissolve in the prepolymer component and thereby contribute to foam formation, while also acting as a good propellant.

30 The propellant component of the prepolymer composition generally constitutes 5 to 40 wt%. The CO₂ content in the propellant can be for example about 5 wt%, based on the total propellant component. The content of gases not condensable under the prevailing pressure conditions should be such that the volume based on the empty space in the pressure tank yields a pressure of about 8 to 10 bars, depending on the relevant
35 national specification for pressure tanks (aerosol cans). The empty space in the pressure tank is the space assumed by the uncondensed components of the prepolymer composition.

The liquid butadiene is expediently added to the prepolymer composition in solution along with an emulsifier - for example in a weight ratio of 80/20 -, preferably in solution
40 with a hydroxy vegetable oil suitable for controlling the isocyanate content of the PU



prepolymer. It has proven especially suitable to use castor oil with a hydroxyl number of 160, but any other hydroxy vegetable oils and hydroxy polyethers and polyesters can also be used. These are hydroxy components as are conventionally used for modifying viscosity in the formulation of prepolymer compositions.

5 The inventive prepolymer compositions can be used as 1C and as 2C polyurethane foams. With 2C foams the polyol component required for curing the foam is kept separate from the prepolymer composition in known fashion and added only directly before or during discharge. The corresponding methods are widely described and known to the expert, as are suitable two-component pressure cans with a separate tank for the
10 second component.

The second component can be in particular usual polyols, in particular glycol, glycerine and butanediol. To accelerate the curing reaction it may be expedient to add to this second component a usual catalyst, for example tin dioctoate, cobalt naphthenate and octoate, dibutyl tin dilaurate, metallic, in particular ferrous, acetonylacetate, DABCO
15 crystalline and N-methyl-2-azanorbornane. Further catalysts are triethylenediamine, trimethylaminoethylpiperazine, pentamethyldiethylene-



triamine, tetramethyliminobispropylamine, bis(dimethylamino-propyl)-N-isopropanolamine. It is also suitable to use heteroaromatic amines, as stated for example in DE-A-42 15 647.

The invention finally relates to the use of liquid polybutadiene, as defined above, as an additive to isocyanate prepolymer compositions for 1C and 2C polyurethane insulating foams for controlling cell opening and dimensional stability. The invention also relates to pressure cans for discharging 1C and 2C polyurethane insulating foams with a prepolymer composition and optionally a separate polyol component, as described above.

Apart from the abovementioned dimensional stability of the inventive prepolymer composition produced with the addition of liquid polybutadiene, the composition has the further advantage that it can be produced substantially free from chlorine and bromine and set to be fire-retardant without a need to add the usual halogen-containing flameproofing agents. This means that the addition of flameproofing agents for B2 foams according to DIN 4102 can be largely or fully dispensed with. This is the case in particular if the composition contains phosphorus-containing thinners or softeners (viscosity regulators), for example triethyl phosphate. A synergistic effect with these softeners occurs with nitrogenous additives and vegetable oils, e.g. castor oil. If necessary, the prepolymer compositions can also be set to be substantially halogen-free, i.e. one can dispense not only with halogen-containing flameproofing agents but also with fluorocarbons as propellants. In this case it is sufficient for the propellant component to contain propane, butane, dimethyl ether and/or CO₂.

It has turned out that these flame-retardant properties are due in particular to the trialkyl and triaryl phosphates and phosphonates. One can mention diphenylcresyl phosphate, triphenyl phosphate, triethyl phosphate, dimethylmethane phosphonate and the like. One can further mention 2-ethylhexyldiphenylphosphate and phosphoric acid-1,3-phenylene-



tetraphenylester, which are commercially available under the designations Posflex 362 and Fyroxflex RDP. Such phosphates and phosphonates can be present in the prepolymer composition in a quantity of 5 to 40 wt%, based on the prepolymer component. They have the advantage that they do not disturb the balance of prepolymer, propellant and thinners in the prepolymer composition but rather stabilize it, while conventional halogen-containing flameproofing agents interfere with this balance and can only be present with about 12 to 14 wt%.

The inventive prepolymer composition is produced in the fashion known in the art, whereby if low-monomer prepolymer is used it is put in the pressure tank as such or arises therein. One then adds to the prepolymer the liquid polybutadiene, e.g. mixed with a surface-active agent and emulsified in a hydroxy oil, for example castor oil. The hydroxy oil or castor oil simultaneously serves to finely adjust the NCO content of the prepolymer and lower the monomer content. Then the additives, such as flameproofing agents, stabilizers, softeners, catalysts, etc., are added, whereupon the pressure tank (aerosol can) is sealed and the propellant impressed.

The invention will be explained by the following compositions.

Example 1

Desmodur E21 as a prepolymer is mixed in a protective atmosphere with a 1% emulsion of a liquid polybutadiene with a molecular weight of about 3000 and a viscosity at 20°C of 3000 mPa.s and a surface-active agent as an emulsifier (weight ratio 80/20; available from Goldschmidt under the designation TEGO IMR 830) in castor oil with a hydroxyl number of 160, the temperature being carefully controlled. Then usual polysiloxanes are added for stabilization and colloidal silica gel for controlling the rheology along with an amine catalyst (Texacat DMDEE, 2,2-dimorpholinodiethylether).

With constant stirring the desired quantity of the



above-described mixture is put in a moisture-free pressure tank which is sealed with a dome provided with a valve, optionally with introduction of a cartridge having the second component. After sealing, a corresponding quantity of propellant is impressed. The individual components of the propellant mixture are expediently impressed successively and optionally filled up again in a second pass. An especially suitable mixture is of 40% propane, 40% butane and 20% dimethylether in combination with a fluorocarbon (R 152a and R 134a) and CO₂.

In the following a monomer-reduced prepolymer composition and filling proportions for a pressure tank with a filling ratio of 75% are stated. The composition yields an insulating foam with good dimensional stability and good insulating properties. The content of residual monomer of the composition is under 10 wt%.

Component	Example 1
Desmodur E21 (16% NCO)	890
Polysiloxane	
Tegostab B 8863T	15
Polysiloxane	
Tegostab BF 2270 (hydroxyl number 40)	15
Tego IMR 830 (1%)*	50
Silica gel Aerosil 200	15
Amine catalyst	
Texacat DMDEE	15
Prepolymer comp. (parts by weight)	1000
NCO (wt%)	13.7
Prepolymer density (g/cm ³)	1.11
Prepolymer composition	
Modified prepolymer	312 g
Propane/butane/dimethylether gas mixture (d=0.56)	30 g
Fluorocarbon	
R 152a	45 g
CO ₂	4 g
Total	391 g
Gas fraction (wt%)	20%



* 1% emulsion in castor oil, hydroxyl number 160. Tego IMR 830 contains 80% of the above-mentioned polyisocyanate and 20% of a surface-active agent emulsifier.

Examples 2 and 3

Inventive prepolymer composition using conventional initial isocyanates were produced by the following recipes analogously to Example 1. The compositions yield an insulating foam with good dimensional stability and good insulating properties. The content of residual monomer in the compositions is 7 wt%.

In the list Desmophen PU 1578 designates a polyol with hydroxyl number 213 and Desmodur 44 V 20 L a polyisocyanate with 31.6 wt% NCO groups. Disflamoll DPK designates a softener based on diphenylcresyl phosphate. The flameproofing agent Fyroflex RDP designates phosphoric acid-1,3-phenylene-tetraphenylester.

Component	Example 2	Example 3
Desmophen PU 1578	380	380
Disflamoll DPK	543	273
Fyroflex RDP	-	270
Tegostab BF 2270	20	20
Tego IMR 830 (10%)*	50	50
Texacat DMDEE	7	7
Polyol mixture (parts by weight)	1000	1000
Polyol mixture	275 g	275 g
Desmodur 44 V 20 L	385 g	385 g
R 134a	75 g	75 g
i-butane	30 g	30 g
Dimethylether	35 g	35 g
Total	800 g	800 g
Gas fraction (wt%)	18%	18%
NCO (wt%)	15.6	15.6

* 10% emulsion in castor oil, hydroxyl number 160



Examples 4 to 6

Inventive prepolymer compositions using conventional initial isocyanates were produced by the following recipes analogously to Examples 1 to 3. The compositions yield an insulating foam with good dimensional stability and good insulating properties. The content of residual monomer in the compositions is under 10 wt%.

In the list Desmodur VPLS 2924 designates a prepolymer with an isocyanate content of 24.0%, Firemaster 836 a commercial flameproofing agent and the gas mixture a propellant mixture of 30% propane, 30% isobutane and 40% dimethylether.

Component	Example 4	Example 5	Example 6
Desmodur VPLS 2924	308	308	308
Firemaster 836	100	100	100
Disflammol DPK	500	500	500
Tegostab BF 2270	20	20	20
Tego IMR 830*	50	50	50
Aerosil 200	15	15	15

Prepolymer composition (parts by weight)	1000	1000	1000
NCO (wt%)	13.7	13.7	13.7
Density (g/ml)	1.11	1.11	1.11

Mod. prepolymer comp.	700 g	670 g	725 g
Gas mixture		70 g	
R 152a	160 g		
R 134a		80 g	140 g
Dimethylether			20 g
CO ₂	4 g	4 g	4 g

Total	864 g	824 g	889 g
Gas fraction (wt%)	19%	19%	18%

* 10% emulsion in castor oil, hydroxyl number 160.

Example 7

A composition for 1.5C foams was prepared as follows.



Component	Parts by weight
-----	-----
Castor oil	320
Softener	420
Levagard PP (TMCP)	
Ixol M 125	170
Tego IMR 830 (10%)	50
Tegostab B 1048	30
Catalyst	10
-----	-----
Polyol component	1000
-----	-----
Polyol component	142 g
Desmodur N 3400	181 g
Propellant R 134a	30 g
R 152a	60 g
DME	10 g
-----	-----
Crosslinker:	
Ethylene glycol	12 g
Thancat AT 10	5 g
-----	-----
Total	427 g
NCO (wt%)	3.86

Desmodur N 3400 is an aliphatic HDI polyisocyanate with 20% NCO. Ixol M 125 is a polyester polyol with a hydroxyl number of 239. TMCP designates trismonochloroisopropylphosphate.



The claims defining the invention are as follows:

1. A prepolymer composition for producing polyurethane insulating foams from pressure tanks which consists of a prepolymer component with at least one PU prepolymer with a content of NCO groups of 4 to 20 wt% and usual additives, as well as
5 a propellant component, said composition comprising 0.01 to 2 wt%, based on the prepolymer component, of polybutadiene or copolymers of 1,3-polybutadiene with up to 50 mol% of other dienes or vinylaromatic compounds, the polybutadiene or copolymer having a molecular weight of 1,000 to 9,000.

2. The prepolymer composition of claim 1, wherein said PU prepolymer is based
10 on aliphatic and aromatic polyisocyanates and hydroxy reaction components.

3. The prepolymer composition of claim 2, wherein the polyisocyanate is hexamethylene-1,6-diisocyanate, naphthalene-1,5-diisocyanate, tolylene diisocyanate, isophorone diisocyanate, diphenylmethane diisocyanate or dicyclohexylmethane diisocyanate.

15 4. The prepolymer composition of any one of claims 1 to 3, comprising 0.02 to 1% by weight of liquid polybutadiene.

5. The prepolymer composition of claim 4, wherein the liquid polybutadiene contains about 75% 1,4-cis double bonds, about 24% 1,4-trans double bonds and about 1% vinyl double bonds, has a molecular weight, determined by vapor-pressure osmosis,
20 of about 3000 and a viscosity at 20°C of about 3000 mPa.s.

6. The prepolymer composition of any one of claims 1 to 5, comprising 5 to 40% by weight of the propellant component.

7. The prepolymer composition of any one of claims 1 to 6, wherein the propellant component contains propane, butane and/or dimethylether.

25 8. The prepolymer composition of any one of claims 1 to 6, wherein the propellant component contains fluorocarbon.

9. The prepolymer composition of claim 8, wherein the fluorocarbon is R 125 (pentafluoroethane), R 134a (non-symmetrical tetrafluoroethane), R 143 (trifluoroethane) and/or R 152a (non-symmetrical difluoroethane).

30 10. The prepolymer composition of any one of claims 1 to 9, wherein the propellant component contains CO₂.

11. The prepolymer composition of claim 10, wherein the propellant component comprises 5% by weight CO₂, based on the propellant component.

12. The prepolymer composition of any one of claims 1 to 11, wherein the initial
35 service viscosity of the prepolymer, as herein defined, is 5000 to 20000 mPa.s at 20°C.

13. The prepolymer composition of claim 12, wherein the viscosity is 8000 to 15000 mPa.s.

14. A prepolymer composition for producing polyurethane insulating foams, substantially as herein described with reference to any one of the Examples.



15. A 1C or 2C polyurethane insulating foam for controlling cell opening and dimensional stability, comprising a prepolymer composition of any one of claims 1 to 14.

16. A pressure can for discharging 1C polyurethane insulating foams comprising the prepolymer composition of any one of claims 1 to 14.

5 17. A pressure can for discharging 1.5C and 2C polyurethane insulating foams with the prepolymer composition of any one of claims 1 to 14 and at least one separate component for curing the prepolymer composition.

Dated 5 March, 1998
Rathor AG

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Patent Attorneys for the Applicant/Nominated Person
SPRUSON & FERGUSON

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A prepolymer composition for insulating foams

Abstract

A prepolymer composition for producing polyurethane insulating foams from pressure tanks which consists of a prepolymer component with at least one PU prepolymer with a content of NCO groups of 4 to 20 wt% and usual additives, as well as a propellant component, with a content of 0.01 to 2 wt%, based on the prepolymer component, of polybutadiene.

INTERNATIONAL SEARCH REPORT

Int. Application No
PCT/EP 94/00383

A. CLASSIFICATION OF SUBJECT MATTER

IPC 5 C08J9/00 C08G18/10 C09K3/30 //(C08G18/10,101:00)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 5 C08J C08G C08L C09K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE,C,38 37 351 (TH. GOLDSCHMIDT AG) 23 November 1989 see claims 1-4 see page 3, line 13 - line 21 ---	1
A	EP,A,0 118 171 (TEXACO DEVELOPMENT CORP.) 12 September 1984 see claims 1-5,8,9 see page 4, line 25 - line 37 see page 8, line 9 - line 18 ---	1
A	EP,A,0 480 342 (TBS ENGINEERING) 15 April 1992 see claims 1-3,14 see page 2, line 56 - page 3, line 17 ---	1
	-/--	

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
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- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "A" document member of the same patent family

Date of the actual completion of the international search

11 May 1994

Date of mailing of the international search report

25.05.94

Name and mailing address of the ISA

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Fax (+ 31-70) 340-3016

Authorized officer

Van Puymbroeck, M

INTERNATIONAL SEARCH REPORT

Int. App. No.
PCT/EP 94/00383

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	DE,A,40 25 843 (P. BUSGEN) 20 February 1992 see claims 1,5,8 see page 2, line 44 - page 3, line 9 -----	1
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A	EP,A,0 462 438 (BAYER) 27 December 1991 see claims 1,4 see page 4, line 1 - line 17 -----	1
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INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. l. Application No

PCT/EP 94/00383

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-C-3837351	23-11-89	EP-A,B 0367071	09-05-90
		ES-T- 2045339	16-01-94
		US-A- 5079270	07-01-92
EP-A-0118171	12-09-84	US-A- 4521581	04-06-85
		JP-B- 4069174	05-11-92
		JP-A- 59168021	21-09-84
EP-A-0480342	15-04-92	DE-A- 4032294	16-04-92
DE-A-4025843	20-02-92	NONE	
EP-A-0462438	27-12-91	DE-A- 4019306	19-12-91
		CA-A- 2044526	17-12-91
		JP-A- 4239039	26-08-92

INTERNATIONALER RECHERCHENBERICHT

Inventar des Aktenzeichens
PCT/EP 94/00383

A. KLASSIFIZIERUNG DES ANMELDUNGSGEGENSTANDES
 IPK 5 C08J9/00 C08G18/10 C09K3/30 //(C08G18/10,101:00)

Nach der Internationalen Patentklassifikation (IPK) oder nach der nationalen Klassifikation und der IPK

B. RECHERCHIERTE GEBIETE
 Recherchiertes Mindestprüfstoff (Klassifikationssystem und Klassifikationssymbole)
 IPK 5 C08J C08G C08L C09K

Recherchierte aber nicht zum Mindestprüfstoff gehörende Veröffentlichungen, soweit diese unter die recherchierten Gebiete fallen

Während der internationalen Recherche konsultierte elektronische Datenbank (Name der Datenbank und evtl. verwendete Suchbegriffe)

C. ALS WESENTLICH ANGESEHENE UNTERLAGEN

Kategorie*	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
A	DE,C,38 37 351 (TH. GOLDSCHMIDT AG) 23. November 1989 siehe Ansprüche 1-4 siehe Seite 3, Zeile 13 - Zeile 21 ---	1
A	EP,A,0 118 171 (TEXACO DEVELOPMENT CORP.) 12. September 1984 siehe Ansprüche 1-5,8,9 siehe Seite 4, Zeile 25 - Zeile 37 siehe Seite 8, Zeile 9 - Zeile 18 ---	1
A	EP,A,0 480 342 (TBS ENGINEERING) 15. April 1992 siehe Ansprüche 1-3,14 siehe Seite 2, Zeile 56 - Seite 3, Zeile 17 --- -/--	1

Weitere Veröffentlichungen sind der Fortsetzung von Feld C zu entnehmen

Siehe Anhang Patentfamilie

- * Besondere Kategorien von angegebenen Veröffentlichungen :
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Datum des Abschlusses der internationalen Recherche 11. Mai 1994	Abmeldedatum des internationalen Recherchenberichts 25.05.94
Name und Postanschrift der internationalen Recherchenbehörde Europäisches Patentamt, P.B. 3318 Patentamt 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tlx. 31 631 epo nl, Fax (+31-70) 340-3016	Bevollmächtigter Beauftragter Van Puymbroeck, M

INTERNATIONALER RECHERCHENBERICHT

Intern. als Aktenzeichen
PCT/EP 94/00383

C.(Fortsetzung) ALS WESENTLICH ANGESEHENE UNTERLAGEN

Kategorie*	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
A	DE,A,40 25 843 (P. BÜSGEN) 20. Februar 1992 siehe Ansprüche 1,5,8 siehe Seite 2, Zeile 44 - Seite 3, Zeile 9 ---	1
A	EP,A,0 462 438 (BAYER) 27. Dezember 1991 siehe Ansprüche 1,4 siehe Seite 4, Zeile 1 - Zeile 17 -----	1

INTERNATIONALER RECHERCHENBERICHT

Angaben zu Veröffentlichungen, die zur selben Patentfamilie gehören

Internationales Aktenzeichen

PCT/EP 94/00383

Im Recherchenbericht angeführtes Patentdokument	Datum der Veröffentlichung	Mitglied(er) der Patentfamilie	Datum der Veröffentlichung
DE-C-3837351	23-11-89	EP-A, B 0367071	09-05-90
		ES-T- 2045339	16-01-94
		US-A- 5079270	07-01-92
EP-A-0118171	12-09-84	US-A- 4521581	04-06-85
		JP-B- 4069174	05-11-92
		JP-A- 59168021	21-09-84
EP-A-0480342	15-04-92	DE-A- 4032294	16-04-92
DE-A-4025843	20-02-92	KEINE	
EP-A-0462438	27-12-91	DE-A- 4019306	19-12-91
		CA-A- 2044526	17-12-91
		JP-A- 4239039	26-08-92