

Description

This invention relates to a method for the preparation of cellular polymeric products derived from organic polyisocyanates and to isocyanate-reactive compositions useful for their preparation.

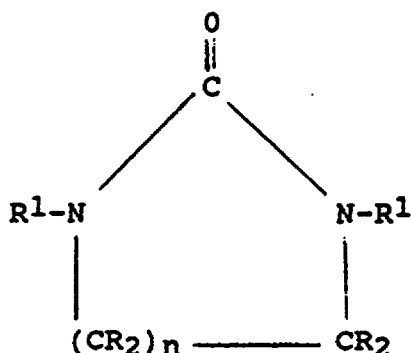
The production of foamed materials based on polyurethane and other polymer systems derived from organic polyisocyanates is well established. Depending upon the formulations used in their manufacture, the products can vary in texture from the soft flexible foams used as cushioning materials to the rigid foams used as insulating or structural materials. Similarly, depending upon the amount of blowing agent used, products having densities varying between about 10 and about 1100 kg/m³ can be made.

For more than thirty years, the principal blowing agents used in the production of these foams have comprised water, which reacts with the polyisocyanate to form carbon dioxide, and fully halogenated chlorofluorocarbons, especially trichlorofluoromethane, which vaporise and expand under the influence of the exothermic polymer-forming reaction.

In recent years, there has been increasing international concern that chlorofluorocarbons may be destroying the earth's protective ozone layer and there is general agreement that their manufacture and use should be severely restricted. Accordingly, it will be necessary in many foam formulations to replace trichlorofluoromethane, at least in part, by other blowing agents. It is not always feasible to use water as the only replacement for chlorofluorocarbons because the urea residues formed by reaction between the polyisocyanate and water can lead to undesirable effects in the foams.

It has now been found that by using certain cyclic ureas the amount of chlorofluorocarbons to be used may be reduced or that by using these cyclic ureas the use of chlorofluorocarbons may even be avoided. In addition to this it has been found that these cyclic ureas may be used in the preparation of improved cellular polymeric materials derived from polyisocyanates, like rigid foams, flexible foams, integral skin foams and elastomers, which may have open cells and/or closed cells.

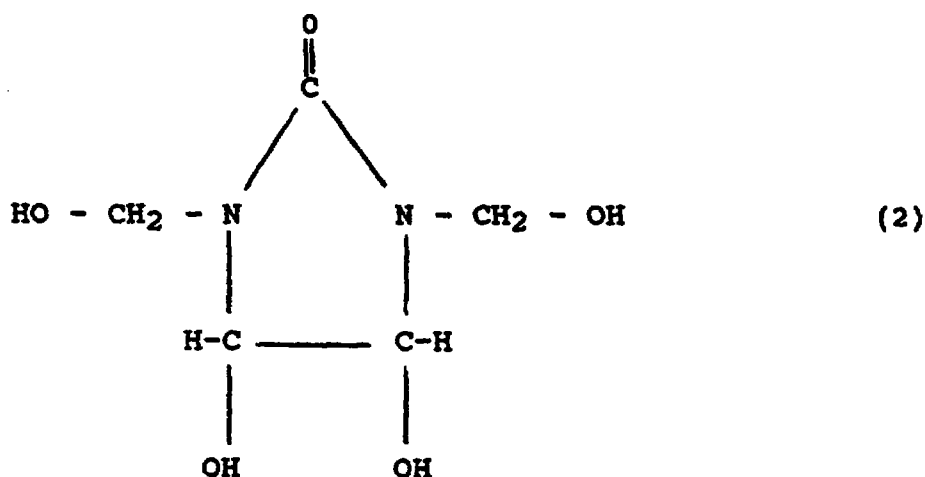
Accordingly, the present invention provides a method for the preparation of cellular polymeric products which comprises reacting an organic polyisocyanate with an isocyanate-reactive composition, characterised in that the isocyanate-reactive composition comprises a blowing promoter which is an isocyanate-reactive cyclic urea compound having at least one isocyanate-reactive substituent, whereas the cyclic urea has the formula :



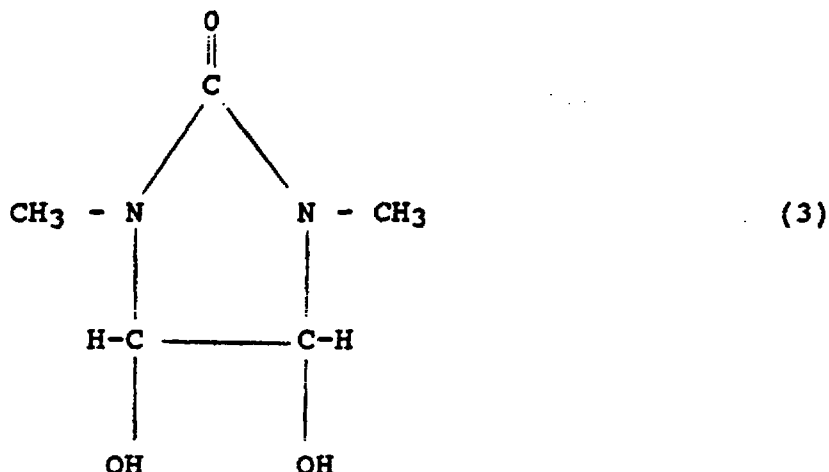
wherein each R¹, independently is a lower alkyl radical of C₁-C₆, or a lower alkyl radical substituted with an isocyanate-reactive group,

wherein each R, independently is H, a lower alkyl radical of C₁-C₆ or - (CH₂)_m - X wherein X is an isocyanate-reactive group which is OH or NH₂, and m is 0, 1 or 2; and wherein n is 1 or 2 with the proviso that at least one R¹ or R is or comprises an isocyanate-reactive group.

Preferred compounds of formula (1) are cyclic ureas of formula



and



Organic polyisocyanates which may be used in the method of the invention include aliphatic, cycloaliphatic and araliphatic polyisocyanates, for example 1,6-hexamethylene diisocyanate, isophorone diisocyanate, cyclohexane-1,4-diisocyanate, 4,4'-dicyclohexylmethanediisocyanate and p-xylylene diisocyanate, but especially those aromatic polyisocyanates conventionally used in the manufacture of polyurethanes and polyisocyanurate foams. Of particular importance are the tolylene diisocyanates (TDI) and diphenylmethane diisocyanates (MDI) in their various pure, modified and crude forms. Special mention may be made of the so-called MDI variants (diphenylmethane diisocyanates modified by the introduction of urethane, allophanate, urea, biuret, carbodiimide, uretonimine or isocyanurate residues) and the polyisocyanate mixtures known in the art as "crude" or "polymeric" MDI.

In performing the method of the invention the polyisocyanate may be reacted with the above described cyclic urea in the absence, or in the presence of other isocyanate-reactive materials.

A preferred embodiment of the invention, however, comprises reacting an organic polyisocyanate with an isocyanate-reactive cyclic urea as hereabove described, in the presence of another isocyanate-reactive compound.

The nature of the isocyanate-reactive compound which may be used in the present invention depends on the type of cellular polymeric product to be obtained, i.e. rigid foam, flexible foam, microcellular elastomer or integral skin foam.

For the preparation of rigid foams, suitable isocyanate-reactive compounds will be especially polyols, having a molecular weight of 62 to 1500 and a functionality of 2-8, especially 3-8.

For the preparation of flexible foams, suitable isocyanate-reactive compounds will be especially polyols having a molecular weight of 1000 to 10000 and a functionality of 2-4. For the preparation of microcellular elastomers and integral skin foams, mixtures of high and low molecular weight isocyanate-reactive compounds will be generally used.

5 Particularly suitable high molecular weight isocyanate-reactive compounds having a molecular weight of 1000 to 10000 and a functionality of 2 to 4, include polyols, polyamines, imine-functional compounds or enamine-containing compounds and mixtures thereof.

Especially suitable low molecular weight isocyanate-reactive compounds having a molecular weight below 1000, preferably of 62 to 1000 and a functionality of 2 to 8, may be selected among

- 10 a) polyols
- b) polyamines
- c) hydroxy amino compounds
- d) imine-functional and/or enamine-containing compounds or mixtures thereof.

Polymeric polyols have been fully described in the prior art and include reaction products of alkylene
15 oxides, for example ethylene oxide and/or propylene oxide, with initiators containing a plurality of active hydrogen atoms per molecule. Suitable initiators include water and polyols, for example glycol, propylene glycol and their oligomers, glycerol, trimethylpropane, triethanolamine, pentaerythritol, sorbitol, and sucrose, and polyamines, for example ethylene diamine, tolylene diamine, diaminodiphenylmethane and polymethylene polyphenylene polyamines, and aminoalcohols, for example ethanolamine and
20 diethanolamine, and mixtures of such initiators. Other suitable polymeric polyols include polyesters obtained by the condensation of appropriate proportions of glycols and higher functionality polyols with dicarboxylic acids. Still further suitable polymeric polyols include hydroxyl terminated polythioethers, polyamides, polyesteramides, polycarbonates, polyacetals, polyolefins and polysiloxanes.

Polyols having a molecular weight below 1000 include simple non-polymeric diols such as ethylene
25 glycol, propylene glycol, dipropylene glycol, tripropylene glycol and 1,4 butane-diol.

Polyamines having a molecular weight of at least 1000 include amino ended polyethers, polyesters, polyesteramides, polycarbonates, polyacetols, polyolefins and polysiloxanes. Polyamines having a molecular weight below 1000 include aliphatic, cycloaliphatic or araliphatic polyamines containing two or more primary and/or secondary amino groups, - such as the low MW amino-ended polyethers -, and aromatic
30 polyamines such as DETDA.

Suitable low MW hydroxy-amino compounds comprise monoethanolamine, diethanolamine, or isopropanol amine.

Suitable imino- or enamino functional reactants include those compounds which are derived from the modification of the above described amino-functional compounds, e.g. upon their reaction with an aldehyde
35 or a ketone.

Mixtures of isocyanate-reactive components varying in chemical structure and/or MW and/or functionality may be used if desired.

It has further been found that the above described isocyanate-reactive cyclic ureas may be used in conjunction with H₂O and/or with inert blowing agents having a boiling point of above -50 °C at 1 bar.

40 The amount of water used as blowing agents may be selected in known manner to provide foams of the desired density, typical amounts being in the range from 0.05 to 5 parts by weight per 100 parts by weight of reactive ingredients, although it may be a particular embodiment of the present invention to incorporate up to 10 % by weight or even up to 20 % by weight of H₂O for the preparation of flexible foams. For the preparation of integral skin foam elastomers, typical amounts of water will range from 0.05 to 1.5 % by
45 weight of reactive ingredients, preferably not more than 0.5 %, more preferably not more than 0.2 % by weight.

Suitable inert blowing agents, include for example perfluorocarbons, hydrofluorocarbons, hydrochlorofluorocarbons, fluorine-containing ethers, fluorine-containing amines, hydrocarbons and dialkyl ethers.

Perfluorocarbons which may be used as blowing agents include perfluoroalkanes and perfluorocycloalkanes, for example perfluorobutane, perfluoropentane or perfluorocyclopentane. Hydrofluorocarbons which may be used as blowing agents include hydrofluoroalkanes and hydrofluorocycloalkanes, for example the symmetrical and unsymmetrical difluoroethanes, trifluoroethanes and tetrafluoroethanes and pentafluoroethane.

Hydrochlorofluorocarbons which may be used as blowing agents include hydrochlorofluoroalkanes and
55 hydrochlorofluorocycloalkanes, for example chlorodifluoromethane, 1,1-dichloro-2,2,2 trifluoroethane, 1,1-dichloro-1-fluoroethane, 1-chloro-1,1-difluoroethane, 1-chloro-1-fluoroethane, 1-chloro-2-fluoroethane, 1-chloro-1,1,2-trifluoroethane, 1-chloro-1,2,2-trifluoroethane, 1,1-dichloro-2,2-difluoroethane and 1,1,2-trichloro-2,2-difluoroethane.

Fluorine-containing ethers which may be used as blowing agents include CF_3OCF_3 , $\text{CF}_2\text{HOCF}_2\text{H}$, $\text{CF}_2\text{HCHFOCF}_2\text{H}$, $\text{CHF}_2\text{CF}_2\text{OCHFCHF}_2$, heptafluoro-1,4-dioxan and 2,2,3,3-tetrafluoro-oxacyclobutane.

Fluorine-containing amines which may be used as blowing agents include $(\text{CHF}_2)_3\text{N}$, $\text{CF}_3\text{N}(\text{CHF}_2)_2$ and N-methyloctafluoro-pyrrolidine.

5 Suitable hydrocarbon blowing agents include aliphatic or cycloaliphatic hydrocarbons of 4 to 7 C atoms, preferably 4 to 6 C atoms. Examples of preferred hydrocarbons include alkanes and cycloalkanes such as pentane, iso-pentane, neopentane, cyclopentane, hexane and cyclohexane.

Suitable dialkyl ethers to be used as blowing agents include compounds having from 2 to 6 C atoms.

As examples of suitable ethers, there may be mentioned

10 CH_3OCH_3
 $\text{CH}_3\text{CH}_2\text{OCH}_3$
 $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$
 $\text{CH}_3\text{CH}_2\text{CH}_2\text{-O-CH}_3$

The total amount of blowing agent used, will be sufficient to provide foams of the desired density, suitable amounts for any given density being readily determined by a person skilled in the art.

The foam-forming reaction may be advantageously carried out in the presence of one or more catalysts.

In addition to the ingredients already mentioned, the foam-forming reaction mixture may contain one or more other auxiliaries or additives conventional to isocyanate-based foam formulations. Such optional additives include, fire retardants, smoke suppressants, organic or inorganic fillers, thixotropic agents, dyes, pigments, mould release agents, surfactants, other chemical blowing agents, and foam stabilisers.

Cellular polymeric products may be prepared according to the invention by reacting an organic polyisocyanate with an isocyanate-reactive component comprising an isocyanate-reactive cyclic urea at an isocyanate index (ratio of isocyanate groups to isocyanate-reactive groups expressed as a percentage) 25 between 40 and 300, preferably between 70 and 190, more preferably between 95 to 120, although higher indices, for example up to 1500, may be employed in conjunction with trimerisation catalysts. Ewer indices may also be used for some purposes, in particular for the preparation of flexible foams.

In operating the method of the invention, the known one-shot prepolymer or semi-prepolymer techniques may be used together with conventional mixing methods and the foams may be produced in the 30 form of slabstock, mouldings, cavity fillings, sprayed foam, frothed foam or laminates with other materials such as hardboard, plasterboard, paper, plastics or metals. By the use of appropriate starting materials and suitable amounts of blowing agents, the polymeric foams obtained by the method of the invention may take the form of rigid foams, flexible foams, microcellular elastomers or integral skin foams.

To reduce the number of component streams delivered to the final mixing apparatus, the isocyanate-reactive cyclic urea, and optionally the substantially insoluble inert organic liquid and other additives, may 35 be pre-mixed with one of the major components of the foam formulation.

In particular, when the foam formulation contains a high MW and/or low MW isocyanate-reactive compound, the isocyanate-reactive cyclic urea, may be mixed with these compounds to form a useful isocyanate-reactive composition.

40 Thus, in a further aspect, the present invention provides an isocyanate-reactive composition comprising at least one isocyanate-reactive compound selected from polyols, polyamines, imino-compounds or en-amino-compounds and an isocyanate-reactive cyclic urea as hereabove described.

Suitable isocyanate-reactive compositions contain from 0.5 to 99 %, preferably from 1 to 60 %, of the isocyanate-reactive cyclic urea on a weight basis. The isocyanate-reactive compositions, which optionally 45 may contain one or more of the other additives known per se in polyurethane foam formulations, may be prepared by a simple mixing process.

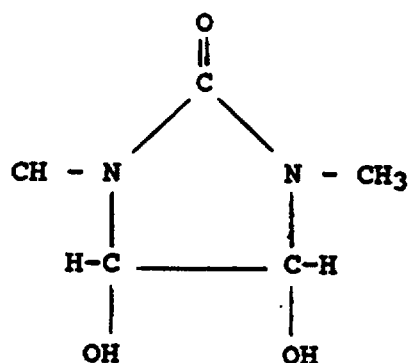
The invention is illustrated by the following Examples in which all parts and percentages are by weight.

Example

50 A microcellular integral skin foam showing good skin properties was obtained by using the following formulation :

Parts by weight

5	A polyether polyol of OH value = 38 and functionality = 2.2	82.18
10	Ethylene glycol	10.00
	DABCO (amine catalyst from Air Products)	0.4
15	Foamrez UL 1 (a tin catalyst commercialised by Witco)	0.017
20	Cyclic urea B	2.44



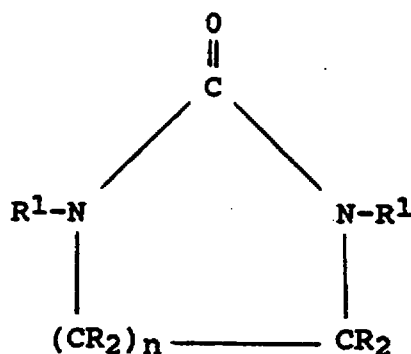
35	A urethane modified MDI commercialised by ICI PLC as "Suprasec VM 021"	75.00
40	The resultant integral skin foam had a density of : Density (g/cm ³)	0.315

Claims

- 45 1. A method for the preparation of cellular polymeric products which comprises reacting an organic polyisocyanate with an isocyanate-reactive composition, characterised in that the isocyanate-reactive composition comprises a blowing promoter which is a cyclic urea compound having at least one isocyanate-reactive substituent whereas the cyclic urea has the formula :

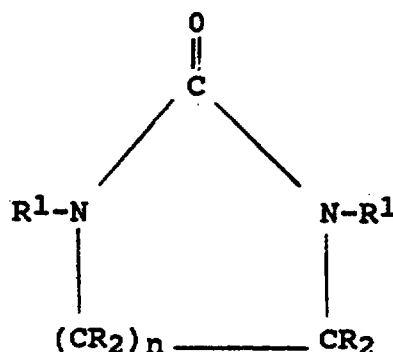
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wherein each R^1 , independently is a lower alkyl radical of $\text{C}_1\text{-C}_6$, or a lower alkyl radical substituted with an isocyanate-reactive group,
 wherein each R, independently is H, a lower alkyl radical of $\text{C}_1\text{-C}_6$ or $-(\text{CH}_2)_m\text{-X}$ wherein X is an isocyanate-reactive group which is OH or NH_2 , and m is 0, 1 or 2; and wherein n is 1 or 2 with the proviso that at least one R^1 or R is or comprises an isocyanate-reactive group.

2. A method according to claim 1 wherein the isocyanate-reactive hydrogen containing composition further comprises a polyol, an amino-, an imino- or enamino-compound or mixtures thereof.
3. A method according to claim 1 wherein the isocyanate-reactive composition further comprises H_2O .
4. A method according to claim 1 wherein the organic polyisocyanate is reacted with the cyclic urea in the presence of an inert volatile blowing agent selected from chlorofluorocarbons, perfluorocarbons, hydrofluorocarbons, hydrochlorofluorocarbons, fluorine-containing ethers, fluorine-containing amines, hydrocarbons and dialkyl ethers.
5. A method according to claim 1 for the preparation of rigid foams.
6. A method according to claim 1 for the preparation of flexible foams.
7. A method according to claim 1 for the preparation of integral skin foams or microcellular elastomers.
8. An isocyanate-reactive composition comprising :
 - a) at least one isocyanate-reactive compound selected from polyols, amine-, imino- or enamino compounds;
 - b) a cyclic urea compound having at least one isocyanate-reactive substituent, having the formula :



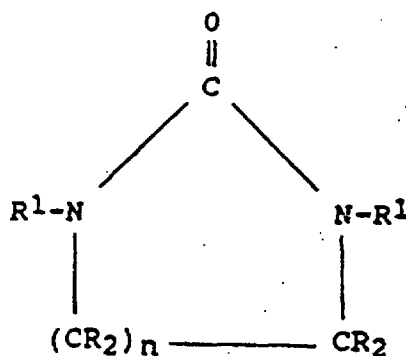
wherein each R^1 , independently is a lower alkyl radical of $\text{C}_1\text{-C}_6$, or a lower alkyl radical substituted with an isocyanate-reactive group,
 wherein each R, independently is H, a lower alkyl radical of $\text{C}_1\text{-C}_6$ or $-(\text{CH}_2)_m\text{-X}$ wherein X is an isocyanate-reactive group which is OH or NH_2 , and m is 0, 1 or 2; and wherein n is 1 or 2 with the

proviso that at least one of R¹ or R is or comprises an isocyanate-reactive group.

9. An isocyanate-reactive composition according to claim 8 comprising :
 - a) at least one isocyanate-reactive compound of molecular weight 1000 to 10000 and of functionality 2 to 4 selected from polyols, polyamines, imino- or enamino compounds, and, optionally,
 - b) at least one isocyanate-reactive compound of molecular weight below 1000 and of functionality 2 to 8 selected among polyols, polyamines, hydroxy amino-compounds, imino- or enamino compounds or mixtures thereof.
10. An isocyanate-reactive composition according to claim 8 or claim 9 which comprises from 0.5 to 60 % of cyclic urea derivatives on a weight basis.
11. An isocyanate-reactive composition according to claim 8 or claim 9 which further comprises H₂O.
12. An isocyanate-reactive composition according to claim 8 or claim 9 which further comprises an inert volatile blowing agent selected among perfluorocarbons, hydrofluorocarbons or hydrocarbons.

Patentansprüche

1. Verfahren für die Herstellung zellulärer Polymerprodukte, das die Umsetzung eines organischen Polyisocyanats mit einer isocyanat-reaktiven Zusammensetzung umfaßt, **dadurch gekennzeichnet**, daß die isocyanat-reaktive Zusammensetzung ein schäumungsförderndes Mittel umfaßt, das aus einer cyclischen Harnstoffverbindung mit mindestens einem isocyanat-reaktiven Substituenten besteht, wobei der cyclische Harnstoff die nachstehende Formel aufweist:



wobei jedes R¹, unabhängig einen Niederalkylrest aus C₁-C₆ oder einen mit einer isocyanat-reaktiven Gruppe substituierten Niederalkylrest darstellt,

wobei jedes R, unabhängig H, einen Niederalkylrest aus C₁-C₆ oder - (CH₂)_m - X darstellt, wobei X eine isocyanat-reaktive Gruppe darstellt, die aus OH oder NH₂ besteht, und m 0, 1 oder 2 ist; und wobei n 1 oder 2 ist, unter der Voraussetzung, daß mindestens ein R¹ oder R eine isocyanat-reaktive Gruppe darstellt oder umfaßt.

2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet**, daß die isocyanat-reaktive, wasserstoffhaltige Zusammensetzung ferner ein Polyol, eine Amino-, eine Imino- oder Enaminoverbindung oder Mischungen davon umfaßt.
3. Verfahren nach Anspruch 1, **dadurch gekennzeichnet**, daß die isocyanat-reaktive Zusammensetzung ferner H₂O umfaßt.
4. Verfahren nach Anspruch 1, **dadurch gekennzeichnet**, daß das organische Polyisocyanat mit dem cyclischen Harnstoff in Gegenwart eines inerten, flüchtigen Treibmittels umgesetzt wird, ausgewählt aus Chlorfluorkohlenstoffen, Perfluorkohlenstoffen, Hydrofluorkohlenwasserstoffen, Hydrochlorfluorkohlenwasserstoffen, fluorhaltigen Ethern, fluorhaltigen Aminen, Kohlenwasserstoffen und Dialkylethern.
5. Verfahren nach Anspruch 1 zur Herstellung von Hartschaumstoffen.

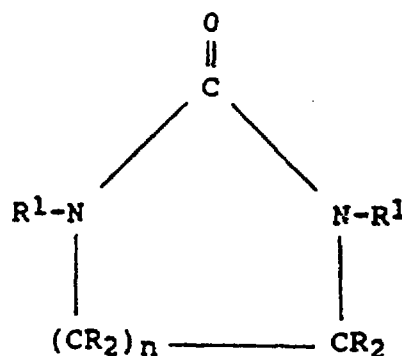


proviso that at least one of R¹ or R is or comprises an isocyanate-reactive group.

9. An isocyanate-reactive composition according to claim 8 comprising :
 - a) at least one isocyanate-reactive compound of molecular weight 1000 to 10000 and of functionality 2 to 4 selected from polyols, polyamines, imino- or enamino compounds, and, optionally,
 - b) at least one isocyanate-reactive compound of molecular weight below 1000 and of functionality 2 to 8 selected among polyols, polyamines, hydroxy amino-compounds, imino- or enamino compounds or mixtures thereof.
10. An isocyanate-reactive composition according to claim 8 or claim 9 which comprises from 0.5 to 60 % of cyclic urea derivatives on a weight basis.
11. An isocyanate-reactive composition according to claim 8 or claim 9 which further comprises H₂O.
12. An isocyanate-reactive composition according to claim 8 or claim 9 which further comprises an inert volatile blowing agent selected among perfluorocarbons, hydrofluorocarbons or hydrocarbons.

Patentansprüche

1. Verfahren für die Herstellung zellulärer Polymerprodukte, das die Umsetzung eines organischen Polyisocyanats mit einer isocyanat-reaktiven Zusammensetzung umfaßt, **dadurch gekennzeichnet, daß** die isocyanat-reaktive Zusammensetzung ein schäumungsförderndes Mittel umfaßt, das aus einer cyclischen Harnstoffverbindung mit mindestens einem isocyanat-reaktiven Substituenten besteht, wobei der cyclische Harnstoff die nachstehende Formel aufweist:

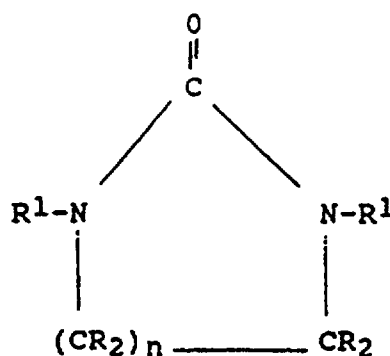


wobei jedes R¹, unabhängig einen Niederalkylrest aus C₁-C₆ oder einen mit einer isocyanat-reaktiven Gruppe substituierten Niederalkylrest darstellt, wobei jedes R, unabhängig H, einen Niederalkylrest aus C₁-C₆ oder - (CH₂)_m - X darstellt, wobei X eine isocyanat-reaktive Gruppe darstellt, die aus OH oder NH₂ besteht, und m 0, 1 oder 2 ist; und wobei n 1 oder 2 ist, unter der Voraussetzung, daß mindestens ein R¹ oder R eine isocyanat-reaktive Gruppe darstellt oder umfaßt.

2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, daß** die isocyanat-reaktive, wasserstoffhaltige Zusammensetzung ferner ein Polyol, eine Amino-, eine Imino- oder Enaminoverbindung oder Mischungen davon umfaßt.
3. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, daß** die isocyanat-reaktive Zusammensetzung ferner H₂O umfaßt.
4. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, daß** das organische Polyisocyanat mit dem cyclischen Harnstoff in Gegenwart eines inerten, flüchtigen Treibmittels umgesetzt wird, ausgewählt aus Chlorfluorkohlenstoffen, Perfluorkohlenstoffen, Hydrofluorkohlenwasserstoffen, Hydrochlorfluorkohlenwasserstoffen, fluorhaltigen Ethern, fluorhaltigen Aminen, Kohlenwasserstoffen und Dialkylethern.
5. Verfahren nach Anspruch 1 zur Herstellung von Hartschaumstoffen.



6. Verfahren nach Anspruch 1 zur Herstellung von Weichschaumstoffen
7. Verfahren nach Anspruch 1 zur Herstellung von Strukturschaumstoffen oder mikrozellularen Elastomeren.
8. Isocyanat-reaktive Zusammensetzung, umfassend:
- a) mindestens eine isocyanat-reaktive Verbindung, ausgewählt aus Polyolen, Amin-, Imino- oder Enaminoverbindungen.
 - b) eine cyclische Harnstoffverbindung mit mindestens einem isocyanat-reaktiven Substituenten, die die nachstehende Formel aufweist:

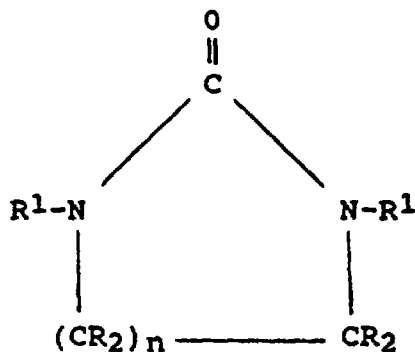


wobei jedes R^1 , unabhängig einen Niederalkylrest aus $\text{C}_1\text{-C}_6$ oder einen mit einer isocyanat-reaktiven Gruppe substituierten Niederalkylrest darstellt, wobei jedes R , unabhängig H , einen Niederalkylrest aus $\text{C}_1\text{-C}_6$ oder $-(\text{CH}_2)_m\text{-X}$ darstellt, wobei X eine isocyanat-reaktive Gruppe darstellt, die aus OH oder NH_2 besteht, und m 0, 1 oder 2 ist; und wobei n 1 oder 2 ist, unter der Voraussetzung, daß mindestens ein R^1 oder R eine isocyanat-reaktive Gruppe darstellt oder umfaßt.

9. Isocyanatreaktive Zusammensetzung nach Anspruch 8, umfassend:
- a) mindestens eine isocyanat-reaktive Verbindung mit einem Molekulargewicht von 1000 bis 10000 und einer Funktionalität von 2 bis 4, ausgewählt aus Polyolen, Polyaminen, Imino- oder Enaminoverbindungen, und gegebenenfalls,
 - b) mindestens eine isocyanat-reaktive Verbindung mit einem Molekulargewicht unterhalb von 1000 und einer Funktionalität von 2 bis 8, ausgewählt aus Polyolen, Polyaminen, Hydroxyaminoverbindungen, Imino- oder Enaminoverbindungen oder Mischungen davon.
10. Isocyanat-reaktive Zusammensetzung nach Anspruch 8 oder Anspruch 9, die 0,5 bis 60% cyclische Harnstoffsderivate, bezogen auf das Gewicht, umfaßt.
11. Isocyanat-reaktive Zusammensetzung nach Anspruch 8 oder Anspruch 9, die ferner H_2O umfaßt.
12. Isocyanat-reaktive Zusammensetzung nach Anspruch 8 oder Anspruch 9, die ferner ein inertes flüchtiges Treibmittel umfaßt, ausgewählt aus Perfluorkohlenstoffen, Hydrofluorkohlenwasserstoffen oder Kohlenwasserstoffen.

Revendications

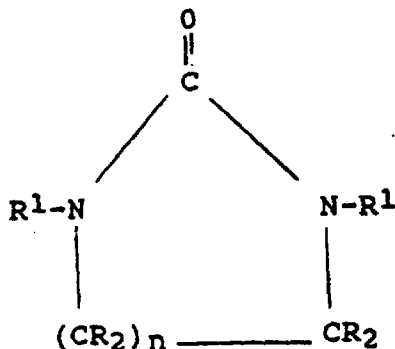
1. Procédé de préparation de produits polymériques cellulaires, qui comprend la réaction d'un polyisocyanate organique avec une composition réactive avec les isocyanates, caractérisé en ce que la composition réactive avec les isocyanates comprend un activateur porogène qui est une urée cyclique possédant au moins un substituant réactif avec les isocyanates, ladite urée cyclique répondant à la formule :



dans laquelle chaque groupe R^1 , indépendamment, représente un radical alkyle inférieur en C_1 à C_6 ou un radical alkyle inférieur substitué avec un groupe réactif avec les isocyanates,

chaque groupe R , indépendamment, représente H , un radical alkyle inférieur en C_1 à C_6 ou $-(\text{CH}_2)_m\text{-X}$ dans lequel X est un groupe réactif avec les isocyanates qui consiste en un groupe OH ou NH_2 , et m est égal à 0, 1 ou 2 ; et n est égal à 1 ou 2, sous réserve qu'au moins un groupe R^1 ou R soit ou comprenne un groupe réactif avec les isocyanates.

2. Procédé suivant la revendication 1, dans lequel la composition contenant de l'hydrogène réactif avec les isocyanates comprend en outre un polyol, un composé à fonction amino, un composé à fonction imino, un composé à fonction énamino ou leurs mélanges.
3. Procédé suivant la revendication 1, dans lequel la composition réactive avec les isocyanates comprend en outre H_2O .
4. Procédé suivant la revendication 1, dans lequel le polyisocyanate organique est amené à réagir avec l'urée cyclique en présence d'un agent porogène volatil inerte choisi entre des chlorofluorocarbones, des perfluorocarbones, des hydrofluorocarbones, des hydrochlorofluorocarbones, des éthers contenant du fluor, des amines contenant du fluor, des hydrocarbures et des éthers de dialkyle.
5. Procédé suivant la revendication 1, pour la préparation de mousses rigides.
6. Procédé suivant la revendication 1, pour la préparation de mousses flexibles.
7. Procédé suivant la revendication 1, pour la préparation de mousses à peau intégrée ou d'élastomères microcellulaires.
8. Composition réactive avec les isocyanates, comprenant :
 - a) au moins un composé réactif avec les isocyanates, choisi entre des polyols, des composés à fonction amino, des composés à fonction imino et des composés à fonction énamino ;
 - b) une urée cyclique possédant au moins un substituant réactif avec les isocyanates, répondant à la formule :





dans laquelle chaque groupe R^1 , indépendamment, représente un radical alkyle inférieur en C_1 à C_6 , ou un radical alkyle inférieur substitué avec un groupe réactif avec les isocyanates, chaque groupe R, indépendamment, représente H, un radical alkyle inférieur en C_1 à C_6 ou $-(CH_2)_m-X$ dans lequel X est un groupe réactif avec les isocyanates qui consiste en un groupe OH ou NH_2 , et m est égal à 0, 1 ou 2 ; et n est égal à 1 ou 2, sous réserve qu'au moins un des groupes R^1 et R représente ou comprenne un groupe réactif avec les isocyanates.

9. Composition réactive avec les isocyanates suivant la revendication 8, comprenant :

a) au moins un composé réactif avec les isocyanates, ayant un poids moléculaire de 1000 à 10 000 et une fonctionnalité de 2 à 4, choisi entre des polyols, des polyamines, des composés à fonction imino et des composés à fonction énamino, et, facultativement,

b) au moins un composé réactif avec les isocyanates, ayant un poids moléculaire inférieur à 1000 et une fonctionnalité de 2 à 8, choisi entre des polyols, des polyamines, des composés à fonction hydroxyamino, des composés à fonction imino, des composés à fonction énamino et leurs mélanges.

10. Composition réactive avec les isocyanates suivant la revendication 8 ou la revendication 9, qui comprend 0,5 à 60 % de dérivés d'urée cycliques, sur base pondérale.

11. Composition réactive avec les isocyanates suivant la revendication 8 ou la revendication 9, qui comprend en outre H_2O .

12. Composition réactive avec les isocyanates suivant la revendication 8 ou la revendication 9, qui comprend en outre un agent porogène volatil inerte choisi entre des hydrocarbures perfluorés, des hydrocarbures fluorés et des hydrocarbures.