

19292/88

COMMONWEALTH OF AUSTRALIA

600416 Patent Act 1952-1969

CONVENTION APPLICATION FOR A PATENT

APPLICATION ACCEPTED AND AMENDMENTS

AMENDED 30-7-90

(1) Here insert (in full) Name or Names of Applicant or Applicants, followed by Address (es).

X (1) BASF AKTIENGESSELLSCHAFT
We of D-6700 Ludwigshafen, Federal Republic of Germany

(2) Here insert Title of Invention.

hereby apply for the grant of a Patent for an invention entitled: ⁽²⁾
PRODUCTION OF THIN FILMS

(3) Here insert number(s) of basic application(s)

which is described in the accompanying complete specification. This application is a Convention application and is based on the application numbered ⁽³⁾

P37 24 543.0

(4) Here insert Name of basic Country or Countries, and basic date or dates

for a patent or similar protection made in ⁽⁴⁾ Federal Republic of Germany on 24th July 1987

~~My~~
Our address for service is Messrs. Edwd. Waters & Sons, Patent Attorneys,
50 Queen Street, Melbourne, Victoria, Australia.

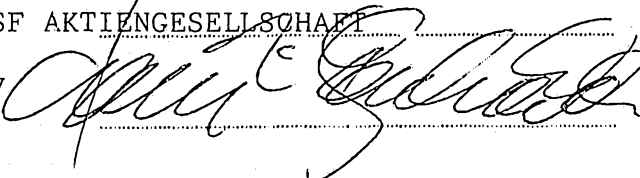
001370 22/07/88

DATED this 21st day of July 1988

(5) Signature (s) of Applicant (s) or Seal of Company and Signatures of its Officers as prescribed by its Articles of Association.

BASF AKTIENGESSELLSCHAFT

by



Louis C. Gebhardt

Registered Patent Attorney

To:

THE COMMISSIONER OF PATENTS.

COMMONWEALTH OF AUSTRALIA

Patents Act 1952-1962

DECLARATION IN SUPPORT OF A CONVENTION
APPLICATION FOR A PATENT OR PATENT OF ADDITION(1) Here
insert (in
full) Name of
Company.

In support of the Convention Application made by⁽¹⁾ _____
 BASF Aktiengesellschaft, a German Joint Stock Company of
 6700 Ludwigshafen, Federal Republic of Germany;

(hereinafter referred to as the applicant) for a Patent

(2) Here
insert title
of invention.for an invention entitled:⁽²⁾ _____

Production of thin films

(3) Here
insert full Name
and Address,
of Company
official
authorized
to make
declaration.

We ~~X~~⁽³⁾ Dr. PETER RICHTERS and PETER BARZ, citizens of the Federal
 Republic of Germany, residing, respectively, at 40 Kerschen-
 steinerstrasse, 6700 Ludwigshafen; and 20 Hochfeldstrasse,
 6700 Ludwigshafen; Federal Republic of Germany;
 do solemnly and sincerely declare as follows:

We are
 1. ~~xxx~~ authorized by the applicant for the patent
 to make this declaration on its behalf.

2. The basic application as defined by Section 141 of the Act was
 made in⁽⁴⁾ the Federal Republic of Germany under No. _____
 on the 24th day of July 1987, by P 37 24 543.0
 BASF Aktiengesellschaft

(4) Here
insert basic
Country or
Countries
followed by
date of date
and basic
Applicant or
Applicants.

~~xxx~~ ~~xxx~~ day of ~~xxx~~ ~~xxx~~ ~~xxx~~ ~~xxx~~ ~~xxx~~

1) GERHARD WEGNER, 2) AREND JAN SCHOUTEN, 3) GISELA DUDA
 and 4) THOMAS ARNDT, 1), 3) and 4) citizens of the Federal
 Republic of Germany and 2) a citizen of Holland, residing,
 respectively, at 1 Carl-Zuckmayer-Strasse, 6500 Mainz-Drais, Fed. Rep.
 of Germany; 70a Groninger Weg, 41-99321 TD Peize, Holland; 11 Fritz-
 Kohl-Strasse, 6500 Mainz, Fed. Rep. of Germany; and 9 St.-Kilian-
 Strasse, 6507 Ingelheim, Fed. Rep. of Germany;

(5) Here
insert (in
full) Name
and Address
of Actual
Inventor or
Inventors.

~~is~~ are the actual inventor s of the invention and the facts upon which the applicant
 is entitled to make the application are as follow:

The applicant is the assignee of _____
 GERHARD WEGNER, AREND JAN SCHOUTEN, GISELA DUDA and THOMAS ARNDT

4. The basic application referred to in paragraph 2 of this Declaration
 was _____ the first application made in a Convention country in
 respect of the invention the subject of the application.

DECLARED at 6700 Ludwigshafen, Federal Republic of Germany
 this 12th day of July 19 88

(5) Signature.

(6) BASF Aktiengesellschaft

To: THE COMMISSIONER OF PATENTS.

[Handwritten signature]

(12) PATENT ABRIDGMENT (11) Document No. AU-B-19292/88
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 602410

(54) Title
PRODUCTION OF THIN FILMS

International Patent Classification(s)
(51)^a B32B 031/04 B32B 015/08 B32B 017/10 B32B 027/08
B32B 031/26 C03C 017/32 C08J 007/04 G02B 001/04

(21) Application No. : 19292/88 (22) Application Date : 22.07.88

(30) Priority Data

(31) Number (32) Date (33) Country
3724543 24.07.87 DE FEDERAL REPUBLIC OF GERMANY

(43) Publication Date : 27.01.89

(44) Publication Date of Accepted Application : 11.10.90

(71) Applicant(s)
BASF AKTIENGESELLSCHAFT

(72) Inventor(s)
GERHARD WEGNER; AREND JAN SCHOUTEN; GISELA DUDA; THOMAS ARNDT

(74) Attorney or Agent
WATERMARK PATENT & TRADEMARK ATTORNEYS, Locked Bag 5, HAWTHORN VIC
3122

(56) Prior Art Documents
AU 19293/88 B32B

(57) The process according to the invention is suitable, for example, for the production of filters for optical purposes, for improving the frictional properties of materials, for the production of protective layers and other relevant uses.

Examples of suitable materials for the substrates serving as the base material are metals, such as gold, platinum, nickel, palladium, aluminum, chromium, niobium, tantalum, titanium, steel and the like. Other suitable materials for the substrates included plastics, such as polyesters, eg. polyethylene terephthalate or polybutylene terephthalate, polyvinyl chloride, polyvinylidene chloride, polytetrafluoroethylene, etc.

Examples of other suitable materials for the substrates are silicon, glass, silica, ceramic materials and cellulose products.

CLAIM

1. A process for the production of thin films of

(11) AU-B-19292/88

-2-

(10) 602416

organic polymers having long-chain side groups on a solid base material, the organic polymer being dissolved in an organic solvent, the solution being spread at the water/air interface by the Langmuir-Blodgett technique and the film being transferred onto a solid base material after evaporation of the organic solvent, wherein organic polymers which contain long-chain n-alkyl side groups bonded to the main chain of the polymer exclusively via polar groups are used as the organic polymers having long-chain side groups, with the proviso that some of these long-chain n-alkyl side groups are replaced by shorter-chain n-alkyl side groups, by branched alkyl side groups having the same or a smaller number of carbon atoms and/or by equally long or shorter side groups having one or more C-C multiple bonds.

COMMONWEALTH OF AUSTRALIA

Form 10

PATENTS ACT 1952-69

COMPLETE SPECIFICATION

(ORIGINAL)

Class

Int. Class

Application Number:

Lodged:

60 2416

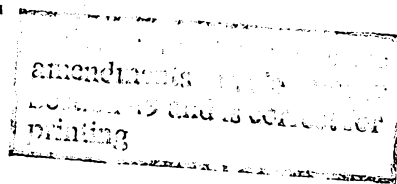
Complete Specification Lodged:

Accepted:

Published:

Priority:

Related Art:



Name of Applicant: BASF AKTIENGESELLSCHAFT

Address of Applicant: D-6700 Ludwigshafen, Federal Republic of Germany

Actual Inventor: GERHARD WEGNER, AREND JAN SCHOUTEN, GISELA DUDA and THOMAS ARNDT

Address for Service: EDWD. WATERS & SONS,
50 QUEEN STREET, MELBOURNE, AUSTRALIA, 3000.

Complete Specification for the invention entitled:

PRODUCTION OF THIN FILMS

The following statement is a full description of this invention, including the best method of performing it known to : US

Production of thin films

The present invention relates to a process for the production of thin films of organic polymers having long-chain side groups on a solid base material by the Langmuir-Blodgett technique, and film elements produced by this process.

The production of monolayers of organic polymers having long-chain side groups by the Langmuir-Blodgett technique is known. For example, C.S. Winter et al. (Thin Solid Films 134 (1985), 49 et seq) investigated Langmuir-Blodgett films of derivatives of octadec-1-ene/maleic anhydride copolymers, polyoctadecyl acrylate and polyoctadecyl methacrylate. Furthermore, S.J. Mumby et al. (Macromolecules 19 (1986), 1054 et seq) studied Langmuir-Blodgett films of the two last-mentioned polymers. A maximum of 6 Z layers with a constant transfer ratio are mentioned here.

H. Nakahara et al. (Thin Solid Films 133 (1985), 29 et seq) investigated the effect of side chain length and main chain rigidity on transfer in the case of cellulose ester, octadecene/maleic anhydride copolymers and their derivatives.

Monomers of poly- γ -benzyl L-glutamate and poly- β -benzyl L-aspartate (S. Ikeda and T. Isemura, Bull. Chem. Soc. Jpn. 34 (1961), 416 et seq) and monolayers of poly- γ -methyl L-glutamate (F. Takeda et al., J. Coll. Int. Sci. 87 (1981), 220 et seq) have also been investigated.

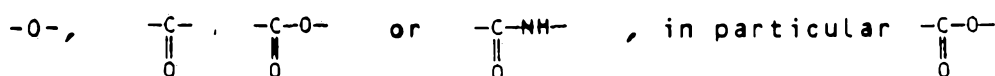
It is an object of the present invention to provide a process for the production of thin films of organic polymers having long-chain side groups by the Langmuir-Blodgett technique, the said process to constitute an improvement with respect to the transferability of the monolayers and to have a constant transfer ratio so that better reproducibility is ensured.

We have found that this object is achieved, surprisingly, by the use of organic polymers which contain long-chain n-alkyl side groups bonded to the main chain

of the polymer exclusively via polar groups, some of these long-chain n-alkyl side groups being replaced by shorter-chain n-alkyl side groups, by branched carbon radicals or by carbon radicals containing C-C multiple bonds. They are therefore comb polymers having different side groups in the same molecule.

The present invention relates to a process for the production of thin films of organic polymers having long-chain side groups on a solid base material, the organic polymer being dissolved in an organic solvent, the solution being spread at the water/air interface by the Langmuir-Blodgett technique and the film being transferred to a solid base material after evaporation of the organic solvent, wherein organic polymers which contain long-chain n-alkyl side groups bonded to the main chain of the polymer exclusively via polar groups are used as the organic polymers having long-chain side groups, with the proviso that some of these long-chain n-alkyl side groups are replaced by shorter-chain n-alkyl side groups, by branched alkyl side groups having the same or a smaller number of carbon atoms and/or by equally long or shorter side groups having one or more C-C multiple bonds.

Preferred polar groups are



Both copolymers and polycondensates can be used as organic polymers having long-chain side groups.

The novel process ^{results in and} is distinguished both by improved transferability of the monolayers ^{resultant} and a constant deposition ratio and better reproducibility.

The present invention also relates to film elements which have been produced by the novel process.

The process according to the invention is suitable, for example, for the production of filters for optical purposes, for improving the frictional properties of materials, for the production of protective layers and other relevant uses.



The base material to be used for the novel process can, if required, be rendered hydrophobic before the application of the copolymer monolayers. Where corresponding copolycondensate monolayers are applied, it is
5 advantageous to render the base material hydrophobic.

Regarding the novel process and the components of the polymers, the following may be stated specifically.

Examples of copolymers are:

polyvinyl alkyl ethers where the n-alkyl chain is of 12
10 to 36 carbon atoms, such as polyvinyl octadecyl ether, some of whose straight-chain octadecyl groups may be replaced by, for example, hexadecyl, dodecyl, decyl, nonyl, octyl, hexyl, n-butyl or isobutyl groups; corresponding copolymers of polyvinyl alkyl ketones of
15 different chain lengths; poly-N-alkylacrylamides or poly-N-alkylmethacrylamides, where the long-chain n-alkyl groups may contain 12 to 36 carbon atoms and are partially replaced by n-alkyl radicals having a smaller chain length or branched alkyl
20 radicals; polymeric esters of acrylic acid, methacrylic acid or other copolymerizable α,β -ethylenically unsaturated monocarboxylic acids having straight-chain alkyl groups of not less than 12, preferably 16 to 36, carbon atoms, some of these long-chain n-alkyl groups being replaced by
25 n-alkyl groups having an alkyl radical which is shorter by one or more, preferably 2 to 8, carbon atoms, or being replaced by branched alkyl groups having the same or a smaller number of carbon atoms in the alkyl radical or by
30 hydrocarbon radicals having the same or a smaller number of carbon atoms, these hydrocarbon radicals containing one or more C-C multiple bonds, for example $-HC=CH-$ or $-C\equiv C-$ groups; C-C multiple bonds can advantageously be introduced by polymer-analogous reaction.

35 Examples of long-chain n-alkyl (meth)acrylates (a) are docosyl (meth)acrylate, eicosyl (meth)acrylate, octadecyl (meth)acrylate, hexadecyl (meth)acrylate,

tetradecyl (meth)acrylate and dodecyl (meth)acrylate.

In the copolymers to be used according to the invention, some of the long-chain n-alkyl (meth)acrylates of this type are replaced by n-alkyl (meth)acrylates having shorter n-alkyl radicals, by those having branched alkyl radicals or by those having C-C multiple bonds.

The proportion of the components (a) and (b) as copolymerized units of the copolymer can vary within wide limits and is in general 50 to 99.5 mol % for component (a) and from 0.5 to 50 mol % for component (b).

Preferred copolymers are those which contain from 80 to 99.5, in particular from 85 to 99, mol % of component (a) and from 0.5 to 20, in particular from 1 to 15, mol % of component (b).

Copolymers of octadecyl (meth)acrylate with hexadecyl (meth)acrylate, dodecyl (meth)acrylate, decyl (meth)acrylate, nonyl (meth)acrylate, octyl or isooctyl (meth)acrylate, hexyl (meth)acrylate, butyl (meth)acrylate or methyl (meth)acrylate are particularly suitable.

Thus, these are copolymers in which the amount of the modifying comonomer (b) may vary depending on its chain length.

(Meth)acrylate copolymers are preferred.

The copolymers to be used according to the invention generally have degrees of polymerization of from 10 to 200. Isotactic copolymers are preferred.

Examples of suitable polycondensates having different side chains are polyesters and, in particular, polyamides. Regarding the choice and combination of the side chains, the statements made in connection with the copolymers are essentially applicable. Among the polyamides, the polyglutamates which contain different ester groups in the γ -position should be mentioned in particular. Poly(γ -octadecyl L-glutamates) where some, eg. 2-20 mol %, of the octadecyl groups are replaced by n-alkyl groups of less than 18, preferably 1 to 16, carbon atoms or corresponding branched alkyl radicals or

hydrocarbon radicals having C-C multiple bonds are preferred.

5 Examples of such polycondensates are poly(γ -methyl-L-glutamate-co- γ -octadecyl-L-glutamate). Such cocondensates can be prepared by polymer-analogous reaction of the polymeric homocondensates, for example by partial transesterification of the poly- γ -methyl L-glutamate with stearyl alcohol (cf. J. Watanabe, Y. Fukuda, R. Gehani and I. Nematyn, *Macromolecules* 17 10 (1984), 1004 et seq).

15 The Langmuir-Blodgett technique, the apparatuses which are suitable for this purpose and the preconditions for carrying out this method are known and are described in, for example, G.L. Gaines, *Insoluble Monolayers at Liquid-Gas Interfaces*, Interscience Publishers, 1966; in particular, reference may be made to pages 44-68, 336-340 and 326-330 of this monograph.

20 The transfer of monolayers is generally effected in the liquid-analogous state. The organic polymers are advantageously dissolved in readily volatile organic solvents, such as methylene chloride, chloroform, benzene, hexane or ethyl acetate, in concentrations of about 0.01-1% by weight, the solvent is evaporated off from the polymer solution applied to 25 the water surface, and the monolayer is precompressed in a conventional manner before transfer onto solid base materials.

30 In general, temperatures of 5 to 35°C, preferably from 10 to 30°C, are employed.

Suitable base materials for the novel film elements, on which the thin, ordered films of well defined structure consisting of organic polymers are applied, are any solid, preferably dimensionally stable substrates of a very wide range of materials. The substrates serving as 35 the base material may be, for example, transparent or translucent, electrically conductive or insulating. The surface of the substrate on which the thin film of the

organic polymers is applied may be rendered hydrophobic. The substrate may consist of a hydrophobic material or the surface of the substrate can be rendered hydrophobic before application of the thin film of the organic polymer in a conventional manner by a suitable pretreatment. The hydrophobic substrate surface to be coated should be very clean so that the formation of a thin, ordered film, in particular a monomolecular or multimolecular layer structure, is not disturbed. For example, the presence of surfactants on the substrate surface to be coated can adversely affect formation of a good monomolecular or multimolecular film. However, it is possible for the substrates serving as the base material to be provided, on the surface to be coated, initially with an intermediate film prior to application of the thin films of the organic polymer, for example in order to achieve good adhesion between the solid, thin film of the organic polymer and the substrate.

Examples of suitable materials for the substrates serving as the base material are metals, such as gold, platinum, nickel, palladium, aluminum, chromium, niobium, tantalum, titanium, steel and the like. Other suitable materials for the substrates included plastics, such as polyesters, eg. polyethylene terephthalate or polybutylene terephthalate, polyvinyl chloride, polyvinylidene chloride, polytetrafluoroethylene, etc.

Examples of other suitable materials for the substrates are silicon, glass, silica, ceramic materials and cellulose products. The surface of glass substrates can, if required, be rendered hydrophobic in a known manner, for example by reaction with alkylsilanes. The choice of the substrate materials depends mainly on the intended use of the novel film element. For optical elements, as a rule transparent or translucent substrates are used as the base material. If the novel film elements are used, for example, in the electrical industry or in electrochemical processes, in particular electrically conductive

materials, such as metals, or materials having electrically conductive, in particular metallic, surface layers, for example metallized plastic films, serve as substrates.

5 The substrates serving as the base material for the novel film elements may have any shape, depending on the intended use. For example, they may be film-like, foil-like, sheet-like, band-like or cylindrical or may be selected from any other shapes. In general, the base
10 materials are flat, even substrates, such as film, foils, sheets, bands, metal sheets and the like. The substrate surface to be coated is preferably smooth, as is usual for the production of thin ordered films having a well defined structure, in particular monomolecular films or
15 multimolecular films. In the case of the flat even substrates, such as films, foils, bands, etc., the novel thin ordered films of well defined structure and consisting of the organic polymers may be applied to one or both surfaces of the substrate.

20 It may be advantageous to heat the resulting novel film element at elevated temperatures, in general from 50 to 200°C, preferably about 100-150°C, directly after transfer of the monomolecular films from the water surface onto the substrate. The heating process as such
25 may last, for example, for from a few minutes to a few hours, depending on the type and thickness of the novel film element. As a result of the heating step following the production of the novel film elements, the properties of the said elements can be stabilized or varied in a
30 specific manner.

 The Examples which follow illustrate the invention. In the Examples, parts and percentages are by weight, unless stated otherwise.

Synthesis of the polymethacrylates

35 Atactic polyoctadecyl methacrylate, homopolymer and copolymers, were prepared in a conventional manner by free radical polymerization in toluene at from 60 to 80°C

using azobisisobutyronitrile as a free radical initiator. After the polymerization, the polymer was worked up by precipitation in methanol and purified by repeated reprecipitation from toluene in methanol. The polymer was finally dried at room temperature under reduced pressure.

Isotactic polyoctadecyl methacrylate, homopolymer and copolymers, was obtained by anionic polymerization using phenylmagnesium bromide as an initiator (by the process due to W.E. Goode et al., J. Pol. Sc. 46 (1960), 317 and 47 (1960), 75. Working up was similar to that for the atactic polymer.

Synthesis of the polypeptides

1. Copolycondensate of γ -methyl L-glutamate and γ -stearyl L-glutamate

Poly- γ -methyl L-glutamate was prepared from the N-carboxyanhydride compound of the ω -methyl ester of L-glutamic acid by polymerization with triethylamine in dioxane as an initiator at room temperature. The N-carboxyanhydride compound was prepared by phosgenation of the ω -methyl ester of L-glutamic acid in dioxane (J.L. Houben, A. Fissi, D. Baccroia, N. Rosato, O. Pieroni and F. Ciardelli, Int. J. Biol. Macromol. 5 (1983), 94). The degree of stearyl substitution (35% of stearyl radicals) was determined by elemental analysis.

The copolycondensate was prepared from poly- γ -methyl L-glutamate by reaction with stearyl alcohol at 60°C. The catalyst used was p-toluenesulfonic acid (J. Watanabe, Y. Fukuda, R. Gehani and I. Nematyu, Macromolecules 17 (1984), 1004). The molecular weight (12,000) was determined by GPC using polystyrene as a standard.

2. Poly(γ -stearyl L-glutamate)

The homopolymer was prepared in the same way as poly- γ -methyl L-glutamate. The ω -stearyl ester of L-glutamic acid was prepared from L-glutamic acid and stearyl alcohol in tert-butanol at 80°C using concentrated sulfuric acid as the catalyst (Neth. Appl. 6, 500, 089, July 7, 1965; CA 64, 2,159g (1966)).

Molecular weights of the polymers:

 $\bar{M}_n \times 10^3$

5	Atactic polyoctadecyl methacrylate	7.2	
	Atactic copolymer of octadecyl methacrylate and dodecyl methacrylate	8	(13 primary mol % of dodecyl methacrylate)
10	Isotactic copolymer of octadecyl methacrylate and hexadecyl methacrylate	8	(5 primary mol % of hexadecyl methacrylate)
	Isotactic polyoctadecyl methacrylate	7	
15	Isotactic polyoctadecyl methacrylate	15	
	Poly(- γ -octadecyl L-glutamate)	3*	
20	Copolycondensate of γ -octadecyl L-glutamate and γ -methyl L-glutamate	$\sim 12^*$	(35% of octadecyl groups)

* From GPC, based on polystyrene

EXAMPLE 1

100 μ l of a 0.1% solution of the isotactic copolymer of 95 primary mol % of octadecyl methacrylate and 5 primary mol % of hexadecyl methacrylate in chloroform (Uvasol quality) were spread on the water surface of a Lauda Langmuir film balance by the conventional method at 28°C. After the solvent had been evaporated, the film was compressed until the surface pressure was 15 mN/m. The film was stabilized under this pressure (about 1 hour). When the surface area occupied was constant, a

small quartz plate which had been rendered hydrophobic with hexamethyldisilazane was immersed vertically by the Langmuir-Blodgett method and pulled up at a speed of 50 mm/min. The first film was transferred while the plate was being pulled up but the next film was transferred as early as during immersion (Y transfer). Transfer in the next cycles was monitored by means of a chart recorder. The pauses set were as follows: immersion in 34 seconds, out of water in 68 seconds. In this way, it was possible to apply not less than 49 films with a constant transfer ratio.

COMPARATIVE EXAMPLE 1

The procedure described in Example 1 was followed, except that the polymer was an isotactic poly-(octadecyl methacrylate) which had virtually no side chain nonuniformity and had the same molecular weight. This resulted in a rapidly decreasing Z-type transfer.

COMPARATIVE EXAMPLE 2

The procedure described in Comparative Example 1 was followed, except that the temperature was 32°C and the pressure 30 mN/m. The result was a Z-type decreasing transfer.

EXAMPLE 2

The procedure described in Example 1 was followed, except that the polymer used was atactic poly-(octadecyl-co-dodecyl methacrylate) (13 primary mol % of dodecyl units). The temperature was 25°C and the pressure 11 mN/m. The result was initially a Z-type transfer which became a Y transfer with constant transfer ratio.

EXAMPLE 3

The procedure described in Example 1 was followed, except that the substrate used was a gold film applied to glass by vapor deposition, and the pressure was 10 mN/m. Y transfer resulted. It was possible to transfer not less than 49 films with constant transfer ratio.

COMPARATIVE EXAMPLE 3

The procedure described in Example 1 was followed, except that the polymer used was an atactic poly-(octadecyl methacrylate) and the pressure was 10 mN/m.

5 The result was virtually no transfer.

EXAMPLE 4

The procedure described in Example 1 was followed, except that the polymer used was a copolycondensate of γ -methyl L-glutamate and γ -octadecyl L-glutamate, the temperature was 20°C and the pressure was 25 mN/m. The result was 100% transfer of up to 200 films or more.

10

COMPARATIVE EXAMPLE 4

The procedure described in Example 4 was followed, except that the polymer used was the homopolymer poly(γ -octadecyl L-glutamate). The result was a rapidly decreasing Y transfer.

15

COMPARATIVE EXAMPLE 5

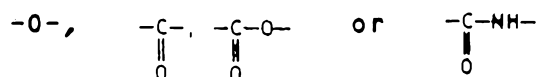
The procedure described in Comparative Example 4 was followed, except that the temperature was 30°C. A decreasing transfer from about the 15th film onward resulted.

20

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A process for the production of thin films of organic polymers having long-chain side groups on a solid base material, the organic polymer being dissolved in an organic solvent, the solution being spread at the water/air interface by the Langmuir-Blodgett technique and the film being transferred onto a solid base material after evaporation of the organic solvent, wherein organic polymers which contain long-chain n-alkyl side groups bonded to the main chain of the polymer exclusively via polar groups are used as the organic polymers having long-chain side groups, with the proviso that some of these long-chain n-alkyl side groups are replaced by shorter-chain n-alkyl side groups, by branched alkyl side groups having the same or a smaller number of carbon atoms and/or by equally long or shorter side groups having one or more C-C multiple bonds.

2. A process as claimed in claim 1, wherein the polar groups are



3. A process as claimed in claim 1, wherein a copolymer is used as the organic polymer having long-chain side groups.

4. A process as claimed in claim 2, wherein a copolymer is used as the organic polymer having long-chain side groups.

5. A process as claimed in claim 1, wherein a polycondensate is used as the organic polymer having long-chain side groups.

6. A process as claimed in claim 2, wherein a polycondensate is used as the organic polymer having long-chain side groups.

7. A process as claimed in claim 3, wherein the copolymer used is a copolymer of

a) polymerized units of an ethylenically unsaturated compound containing n-alkyl ester or n-alkyl ether groups, where the alkyl radical of the ester or ether

- group is of not less than 12 carbon atoms, and
- b) polymerized units of one or more further ethylenically unsaturated compounds which differ from (a) and contain alkyl ester or alkyl ether groups, the alkyl radical of the ester and ether groups having a smaller number of carbon atoms than that of (a), being branched or containing one or more C-C multiple bonds.
8. A process as claimed in claim 2, wherein the copolymer used is a copolymer of
- a) polymerized units of an ethylenically unsaturated compound containing n-alkyl ester or n-alkyl ether groups, where the alkyl radical of the ester or ether group is of not less than 12 carbon atoms, and
- b) polymerized units of one or more further ethylenically unsaturated compounds which differ from (a) and contain alkyl ester or alkyl ether groups, the alkyl radical of the ester and ether groups having a smaller number of carbon atoms than that of (a), being branched or containing one or more C-C multiple bonds.
9. A process as claimed in claim 7, wherein the copolymer used is a copolymer which contains alkyl acrylates or methacrylates as copolymerized alkyl ester-containing polymerizable ethylenically unsaturated compounds.
10. A process as claimed in claim 7, wherein the copolymer contains, as copolymerized component (a), an ester of (meth)acrylic acid where the n-alkyl radical of the ester group is of 16 to 36 carbon atoms.
11. A process as claimed in claim 7, wherein the copolymer contains, as copolymerized component (b), an ester of (meth)acrylic acid where the alkyl radical of the ester group is of 6 to 16 carbon atoms.
12. A process as claimed in claim 7, wherein the copolymer contains, as copolymerized component (b), an ester of (meth)acrylic acid where the alkyl radical of the ester group is shorter than the n-alkyl radical of the ester group of component (a) by 4 or more carbon atoms.

13. A process as claimed in claim 1, wherein the copolymer used as the organic polymer has a degree of polymerization of from 10 to 200.

14. A process as claimed in claim 1, wherein the copolymer used as the organic polymer is isotactic.

15. A process as claimed in claim 7, wherein the organic polymer used is a copolymer of octadecyl (meth)acrylate as component (a) and an alkyl (meth)acrylate, where alkyl is of 6 to 16 carbon atoms, as component (b).

16. A process as claimed in claim 7, wherein the copolymer used as the organic polymer contains from 50 to 99.5 mol % of component (a) and from 0.5 to 50 mol % of component (b) as copolymerized units.

17. A process as claimed in claim 1, wherein the organic polymer used is a copolymer of a vinyl ether.

18. A process as claimed in claim 1, wherein the organic polymer used is a polycondensate which contains two or more different ester or ether side groups, one of the ester or ether groups having an n-alkyl radical of 12 or more carbon atoms and the other having an alkyl radical with a smaller number of carbon atoms, a branch or one or more C-C multiple bonds.

19. A process as claimed in claim 1, wherein the organic polymer used is a polycondensate having a helical structure.

20. A process as claimed in claim 1, wherein the organic polymer used is a polycondensate of copolyglutamates having different alkyl substituents in the γ -position.

21. A process as claimed in claim 5, wherein the polycondensate used is a copolycondensate of γ -alkyl L-glutamate and γ -alkyl' L-glutamate, where alkyl is an alkyl radical of 1 to 6 carbon atoms and alkyl' is an alkyl radical of 12 to 36 carbon atoms.

22. A process as claimed in claim 3, wherein the polycondensate used is a copolycondensate of γ -methyl L-glutamate and γ -octadecyl L-glutamate.

23. A process as claimed in claim 1, wherein application of the thin films onto the solid base material is followed by a heating process.

24. A film element having a base material and, applied thereon, one or more solid, thin ordered films of defined uniform and regular structure with uniform molecular orientation in one direction, consisting of an organic polymer which is soluble in an organic, water-immiscible solvent, wherein the said film element is produced by a process as claimed in claim 1.

DATED this 21st day of July 1988.

BASF AKTIENGESELLSCHAFT

EDWD. WATERS & SONS
PATENT ATTORNEYS
50 QUEEN STREET
MELBOURNE. VIC. 3000.