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<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top; border-right: 1px solid black; padding: 5px;"> (21) International Application Number: PCT/US97/13971 (22) International Filing Date: 12 August 1997 (12.08.97) (71) Applicant: ALCON LABORATORIES, INC. [US/US]; 6201 South Freeway, Fort Worth, TX 76134-2099 (US). (72) Inventors: LEBOEUF, Albert, R.; 7861 Mahonia Drive, Forth Worth, TX 76133 (US). KARAKELLE, Mutlu; 6713 Glen Meadow Drive, Fort Worth, TX 76132 (US). (74) Agents: RYAN, Patrick, M. et al.; Alcon Laboratories, Inc., Patent Dept., Q-148, 6201 South Freeway, Fort Worth, TX 76134-2099 (US). </td> <td style="width: 50%; vertical-align: top; padding: 5px;"> (81) Designated States: AU, CA, CN, JP, MX, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> </td> </tr> </table>			(21) International Application Number: PCT/US97/13971 (22) International Filing Date: 12 August 1997 (12.08.97) (71) Applicant: ALCON LABORATORIES, INC. [US/US]; 6201 South Freeway, Fort Worth, TX 76134-2099 (US). (72) Inventors: LEBOEUF, Albert, R.; 7861 Mahonia Drive, Forth Worth, TX 76133 (US). KARAKELLE, Mutlu; 6713 Glen Meadow Drive, Fort Worth, TX 76132 (US). (74) Agents: RYAN, Patrick, M. et al.; Alcon Laboratories, Inc., Patent Dept., Q-148, 6201 South Freeway, Fort Worth, TX 76134-2099 (US).	(81) Designated States: AU, CA, CN, JP, MX, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i>
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(54) Title: OPHTHALMIC LENS POLYMERS				
(57) Abstract High refractive index copolymers suitable for use in ophthalmic lenses, such as foldable intraocular lenses, are disclosed. The high refractive index copolymers of the present invention consist essentially of (i) one or more monomers having structure (I) wherein: X is H or CH₃; m is 0-10; Y is nothing, O, S, or NR wherein R is H, CH₃, C_nH_{2n+1} (n=1-10) iso OC₃H₇, C₆H₅, or CH₂C₆H₅; Ar is any aromatic ring which can be unsubstituted or substituted with H, CH₃, C₂H₅, n-C₃H₇, iso-C₃H₇, OCH₃, C₆H₁₁, Cl, Br, C₆H₅, or CH₂C₆H₅; and (ii) one or more monomers having structure (II) wherein: X, X' are independently H or CH₃; n, n' are independently 2 or 3; m, m' are independently 2-25; Ar, Ar' are independently as defined above; a is 1 or 2 and Z is C(CH₃)₂ or S(=O)₂. $\begin{array}{c} \text{X} \\ \\ \text{CH}_2=\text{C}-\text{COO}-(\text{CH}_2)_m-\text{Y}-\text{Ar} \end{array} \quad (I)$ $\begin{array}{ccccccc} \text{X} & \text{O} & & & \text{O} & \text{X}' & \\ & & & & & & \\ \text{CH}_2=\text{CH}-\text{CO}-((\text{CH}_2)_n\text{O})_m-[\text{Ar}-\text{Z}-\text{Ar}']_a-\text{O}-((\text{CH}_2)_{n'}\text{O})_{m'}-\text{C}-\text{CH}=\text{CH}_2 \end{array} \quad (II)$				

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OPHTHALMIC LENS POLYMERS

FIELD OF THE INVENTION

5 This invention relates to polymers and their use in ophthalmic lenses, particularly intraocular lenses that can be inserted through small incisions.

BACKGROUND OF THE INVENTION

10 In response to the development of cataractous lenses, it has become common to replace the lens with an intraocular lens (IOL) in a surgical procedure. In order to reduce the trauma to the eye in cataract surgery, it is desirable to keep the incision through which the surgical procedure is conducted as small as possible. With the development of phacoemulsification surgery, in which the lens is fragmented by
15 ultrasonic vibrations and the fragments aspirated through a small cannula, it has become possible to remove a lens through an incision no larger than 2-3 millimeters.

 However, since an IOL is typically at least six millimeters in diameter, an incision at least that large has to be made to permit the insertion of the IOL. In order to permit the use of the desirable small incision technique, various flexible, distortable, and
20 inflatable IOLs have been devised.

 Juergens, U.S. Patent No. 4,619,662, discloses a collapsible intraocular lens with a hollow interior which can be evacuated to cause the lens to collapse to a relatively small size. The collapsed lens can then be inserted into the eye through a
25 relatively small incision. After insertion, the interior of the lens is filled with an elastomer to expand the lens to the proper shape and dimension.

 Mazzocco, U.S. Patent No. 4,573,998, discloses a deformable intraocular lens that can be rolled, or folded to fit through a relatively small incision. The deformable
30 lens is inserted while it is held in its distorted configuration, then released inside the chamber of the eye, whereupon the elastic property of the lens causes it to resume its molded shape. As suitable materials for the deformable lens, Mazzocco discloses

polyurethane elastomers, silicone elastomers, hydrogel polymer compounds, organic or synthetic gel compounds and combinations thereof.

Keates et al., U.S. Patent No. 4,619,657, disclose a flexible intraocular lens holder made from a flexible inert polymer, such as silicone rubber, which contains pockets for receiving individual lenses which are small enough to fit through a relatively small incision. The lens holder is folded or rolled and inserted through a small incision and thereafter several of the small lenses are inserted through the incision and into the pockets in the lens holder to form a composite intraocular lens.

Gasser et al., U.S. Patent No. 5,224,957, disclose photopolymerizable compositions useful in forming an intraocular lens in situ. The compositions are delivered into the natural lens capsule or a this plastic shell substitute and then polymerized. The reference compositions contain 90 - 99.99% by weight of at least one at least difunctional acrylic and/or methacrylic acid ester. Suitable acid esters include bisphenol A or bishydroxypolyalkoxy bisphenol A derivatives lengthened with ethylene oxide or propylene oxide. Preferred acrylic and/or methacrylic acid esters include those having the formula:

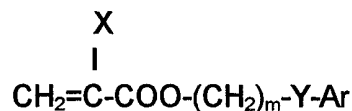


wherein n, m = 1-5, and x, y = 1-3.

There is a need for a material, with a relatively high refractive index, that can be used to form a flexible intraocular lens capable of being simply rolled or folded for insertion through a small incision.

SUMMARY OF THE INVENTION

This invention is directed to high refractive index copolymers consisting essentially of (i) one or more monomers having the structure:



wherein: X is H or CH₃;

m is 0-10;

Y is nothing, O, S, or NR wherein R is H, CH₃, C_nH_{2n+1} (n=1-10) iso OC₃H₇, C₆H₅, or CH₂C₆H₅;

Ar is any aromatic ring which can be unsubstituted or substituted with H, CH₃, C₂H₅, n-C₃H₇, iso-C₃H₇, OCH₃, C₆H₁₁, Cl, Br, C₆H₅, or CH₂C₆H₅;

and (ii) one or more monomers having the structure:



wherein: X, X' are independently H or CH₃;

n, n' are independently 2 or 3;

m, m' are independently 2 - 25;

Ar, Ar' are independently as defined above;

a is 1 or 2; and

Z is C(CH₃)₂ or S(=O)₂.

These copolymers can be used to form various types of ophthalmic lenses, including, but not limited to, intraocular lenses, contact lenses, spectacle lenses, lenses for optical instruments. For example, the copolymers defined above may be used to form intraocular lenses that have high refractive indexes, are flexible

and transparent, can be inserted into the eye through a relatively small incision, and recover their original shape after insertion.

BRIEF DESCRIPTION OF THE DRAWINGS

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Figure 1 shows a multipiece intraocular lens.

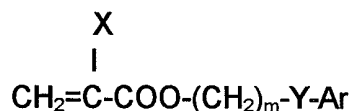
Figure 2 shows a cross-section of a mold for making intraocular lenses.

DETAILED DESCRIPTION OF THE INVENTION AND PREFERRED EMBODIMENTS

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The high refractive index copolymers of the present invention consist essentially of (i) one or more monomers having the structure:

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wherein: X is H or CH₃;

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m is 0-10;

Y is nothing, O, S, or NR wherein R is H, CH₃, C_nH_{2n+1} (n=1-10) iso OC₃H₇, C₆H₅, or CH₂C₆H₅;

Ar is any aromatic ring which can be unsubstituted or substituted with H, CH₃, C₂H₅, n-C₃H₇, iso-C₃H₇, OCH₃, C₆H₁₁, Cl, Br, C₆H₅, or CH₂C₆H₅;

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and (ii) one or more monomers having the structure:

30



wherein: X, X' are independently H or CH₃;

n, n' are independently 2 or 3;

m, m' are independently 2 - 25;

Ar, Ar' are independently as defined above;

a is 1 or 2; and

Z is $C(CH_3)_2$ or $S(=O)_2$.

5

Type (i) monomers are known and include, but are not limited to: 2-phenoxyethyl acrylate, 2-phenylethylthio acrylate, 2-phenylethylamino acrylate, phenyl acrylate, benzyl acrylate, 2-phenylethyl acrylate, 3-phenylpropyl acrylate, 4-phenylbutyl acrylate, 4-methylphenyl acrylate, 4-methylbenzyl acrylate, 2-2-methylphenylethyl acrylate, 2-3-methylphenylethyl acrylate, 2-4-methylphenylethyl acrylate, and the like, including their corresponding methacrylates. These acrylic/methacrylic monomers and others are disclosed in U.S. Patent No. 5,290,892, the entire contents of which are hereby incorporated by reference.

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Preferred monomers of type (i) are those where X is H; m is 2-4; Y is nothing or O; and Ar is phenyl. Most preferred are 2-phenylethyl acrylate, 2-phenoxyethyl acrylate, 3-phenylpropyl acrylate, 3-phenoxypropyl acrylate, 4-phenylbutyl acrylate, and 4-phenoxybutyl acrylate.

20

The amount of type (i) monomer present in the high refractive index copolymers of the present invention will vary depending upon the identity of the type (i) monomer(s), the identity of the type (ii) monomer(s) and the mechanical properties desired for the final copolymer. For example, foldable intraocular lenses are preferably made from polymers having a glass transition temperature no greater than normal room temperature, e.g., about 20°C, in order that the lenses can be rolled or folded conveniently at room temperature. Additionally, copolymers exhibiting an elongation of at least 150% are preferred for use in foldable intraocular lenses because such lenses must exhibit sufficient strength to allow them to be folded without fracturing. More preferred for foldable intraocular lens applications are polymers having an elongation of at least 200%. Thus, for foldable intraocular lens applications, the copolymers of the present invention will generally contain at least

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about 60% by weight, preferably at least about 80% by weight, of the type (i) monomer(s).

Type (ii) monomers can be synthesized using known methods and many are commercially available from a variety of sources (e.g., Dajac Laboratories, Inc. (Feasterville, PA). Preferred type (ii) monomers are those where n and n' are 2; m and m' are independently 2 - 12; Ar and Ar' are phenyl; Z is $C(CH_3)_2$; and a is 1. Most preferred is the type (ii) monomer where $X=X'=H$, $n=n'=2$, $m=m'=2$, $Ar=Ar'$ =phenyl, $a=1$, and $Z=C(CH_3)_2$ [hereinafter referred to as "Ethoxylated (4 moles) bisphenol A diacrylate"].

As in the case of the monomer of type (i), the amount of type (ii) monomer present in the in the high refractive index copolymers of the present invention will vary depending upon the identity of the type (i) monomer(s), the identity of the type (ii) monomer(s), and the mechanical properties desired for the final copolymer. In general, for foldable intraocular lens applications, the copolymers of the present invention will contain from about 10 to about 40% by weight, preferably from about 10 to about 20% by weight, of the type (ii) monomer(s).

For foldable intraocular lens applications, if the type (i) monomer is chosen to be a methacrylate derivative, then m and m' in the type (ii) monomer will be relatively large. On the other hand, if the type (i) monomer is chosen to be an acrylate derivative, then m and m' in the type (ii) monomer will be relatively small in order to achieve a flexible, foldable copolymeric material.

Although not essential, the copolymers of the present invention may optionally contain one or more of a variety of other ingredients, such as polymerization initiators, copolymerizable cross-linking monomers, and copolymerizable UV- or blue-light blocking chromophores. Polymerization initiators may be, for example, thermal or light-activated initiators.

Typical thermal free radical initiators include peroxides, such as benzophenone peroxide, peroxyarbonates, such as bis-(4-t-butylcyclohexyl) peroxydicarbonate, azonitriles, such as azobisisobutyronitrile, and the like. Preferred initiators are bis-(4-t-butylcyclohexyl) peroxydicarbonate and t-butyl peroxy-2-ethyl hexanoate ("t-butyl-peroctoate"). Alternatively, the monomers can be photopolymerized by using a mold which is transparent to radiation of a wavelength capable of initiating polymerization of these acrylic monomers by itself. For materials lacking UV-absorbing chromophores, conventional photoinitiator compounds, e.g., a benzophenone-type photoinitiator, can also be introduced to facilitate the polymerization. Photosensitizers can be introduced as well to permit the use of longer wavelengths; however, in preparing a polymer which is intended for long residence within the eye, it is generally preferable to keep the number of ingredients in the polymer to a minimum to avoid the presence of materials which might leach from the lens into the interior of the eye.

If desired, suitable cross-linking monomers include almost any terminally ethylenically unsaturated compound having more than one unsaturated group. Suitable cross-linking agents include, for example: ethylene glycol dimethacrylate, diethylene glycol dimethacrylate, allyl methacrylate, 1,3-propanediol dimethacrylate, allyl methacrylate, 1,6-hexanediol dimethacrylate, 1,4-butanediol dimethacrylate, and the like. A preferred cross-linking agent is 1,4-butanediol diacrylate (BDDA).

Ultraviolet and/or blue-light absorbing chromophores can also be included in the copolymers of the present invention, as may be desirable in the case where the copolymers are used to make intraocular lenses. Such chromophores allow the light absorbance of an intraocular lens to approximate that of the eye's natural lens. The ultraviolet absorbing material can be any compound which absorbs ultraviolet light, i.e., light having a wavelength shorter than about 400 nm, but does not absorb any substantial amount of visible light. The ultraviolet absorbing compound is incorporated into the monomer mixture and is entrapped in the polymer matrix when the monomer mixture is polymerized. Suitable ultraviolet absorbing compounds include substituted benzophenones, such as 2-hydroxybenzophenone,

and 2-(2-hydroxyphenyl)-benzotriazoles. It is preferred to use an ultraviolet absorbing compound which is copolymerizable with the type (i) and (ii) monomers described above and is thereby covalently bound to the polymer matrix. In this way possible leaching of the ultraviolet absorbing compound out of the lens and into the interior of the eye is minimized. Suitable copolymerizable ultraviolet absorbing compounds are the substituted 2-hydroxybenzophenones disclosed in U.S. Patent No. 4,304,895 and the 2-hydroxy-5-acryloxyphenyl-2H-benzotriazoles disclosed in U.S. Patent No. 4,528,311. The most preferred ultraviolet absorbing compound is 2-(3'-methallyl-2'-hydroxy-5'-methyl phenyl) benzotriazole.

As in the case of UV-absorbers, it is preferred to use blue-light absorbing compounds which are copolymerizable with the type (i) and type (ii) monomers. Suitable polymerizable blue-light blocking chromophores include those disclosed in U.S. Patent No. 5,470,932.

The copolymers of this invention are prepared by generally conventional polymerization methods. For example, a mixture of the liquid monomers in the desired proportions together with a conventional thermal free-radical initiator is prepared. The mixture can then be introduced into a mold of suitable shape to form an ophthalmic lens, and the polymerization carried out by gentle heating to activate the initiator.

Intraocular lenses (IOLs) constructed of the disclosed polymers can be of any design capable of being rolled or folded into a small cross section that can fit through a relatively smaller incision. For example, the IOLs can be of what is known as a one piece or multipiece design. Typically, an IOL comprises an optic and at least one haptic. The optic is that portion which serves as the lens and the haptics are attached to the optic and are like arms which hold the optic in its proper place in the eye. The optic and haptic(s) can be of the same or different material. A multipiece lens, as shown in Figure 1, is so called because the optic and the haptic(s) are made separately and then the haptics are attached to the optic. Haptics may be attached to the optic using conventional techniques. In a single piece lens, the optic

and the haptics are formed out of one piece of material. Depending on the material, the haptics are then cut, or lathed, out of the material to produce the IOL.

Molding and drilling operations are easily carried out if the optic is molded between two polypropylene mold halves as shown in Figure 2. The mold containing the cured optic material is then placed on a lathe and the desired optic diameter is lathe cut. The mold may then be easily mounted to carry out any drilling operations prior to removing the mold halves. Both the lathing and drilling operations may be facilitated by cooling the mold/optic in a freezer to less than 10°C and preferably less than 0°C prior to each of these operations.

The invention will be further illustrated by the following examples which are intended to be illustrative, but not limiting.

EXAMPLES

The mixtures of Examples 1 - 3, shown in Table 1 below, were each transferred into two molds: (i) an IOL mold of the type illustrated in Figure 1 and (ii) a slab mold made of two polypropylene plates. The filled molds were clamped with spring clamps and cured in an oven for 2 hours at 80 °C and 2 hours at 110 °C. At the end of the polymerization period, the molds were allowed to cool to room temperature. The molds were then opened and the cured intraocular lens and sheet of polymer were removed.

Table 1

Ingredient	Example #		
	1	2	3
2-Phenylethyl acrylate	89.6*	83.2	76.2
Ethoxylated (4 moles) Bisphenol A Diacrylate	10.0	17.2	24.3
o-Methallyltinuvin P	0.8	0.6	0.6
t-butyl peroctoate	1	1	1

*All values are expressed as parts by weight.

The physical properties of the cured lenses and slabs, shown in Table 2 below, were analyzed (room temperature conditions) as follows: the glass transition temperature (T_g) was measured by differential thermal analysis using conventional equipment. The Secant Modulus (psi), tensile strength (psi), and ultimate elongation (% strain) were determined using an Instron Model 1122 Material Tester for a dumbbell-shaped sample of material. The refractive index was measured with an Abbe refractometer.

Table 2

Physical Property	Example #		
	1	2	3
T_g ($^{\circ}\text{C}$)	7.2	11.5	15.2
Secant Modulus (psi)	78	175	390
Tensile Strength (psi)	570	661	1256
% Strain	575	335	339
Refractive Index	1.5575	1.5579	1.5587

The invention having now been fully described, it should be understood that it may be embodied in other specific forms or variations without departing from its spirit or essential characteristics. Accordingly, the embodiments described above are to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are intended to be embraced therein.

WE CLAIM:

1. A copolymer consisting essentially of (i) one or more monomers having the structure:



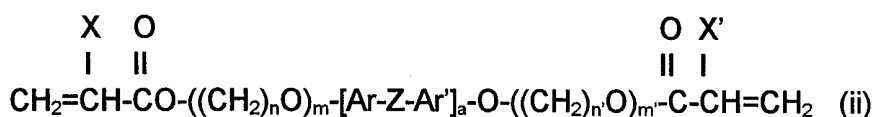
wherein: X is H or CH₃;

n is 0-10;

Y is nothing, O, S, or NR wherein R is H, CH₃, C_nH_{2n+1} (n=1-10) iso OC₃H₇, C₆H₅, or CH₂C₆H₅;

Ar is any aromatic ring which can be unsubstituted or substituted with H, CH₃, C₂H₅, n-C₃H₇, iso-C₃H₇, OCH₃, C₆H₁₁, Cl, Br, C₆H₅, or CH₂C₆H₅;

and (ii) one or more monomers having the structure:



wherein: X, X' are independently H or CH₃;

n, n' are independently 2 or 3;

m, m' are independently 2 - 25;

Ar, Ar' are independently as defined above;

a is 1 or 2; and

Z is C(CH₃)₂ or S(=O)₂.

2. The copolymer of Claim 1 wherein the monomer(s) of structure (i) have X = H; n = 2-4; Y = nothing or O; and Ar = phenyl.

3. The copolymer of Claim 2 wherein the monomer(s) of structure (i) are selected from the group consisting of 2-phenylethyl acrylate, 2-phenoxyethyl acrylate, 3-

phenylpropyl acrylate, 3-phenoxypropyl acrylate, 4-phenylbutyl acrylate, and 4-phenoxybutyl acrylate.

4. The copolymer of Claim 1 wherein the monomer(s) of structure (ii) have X and X' = H, n and n' = 2; m and m' independently = 2 - 12; Ar and Ar' = phenyl; Z = C(CH₃)₂; and a is 1.
5. The copolymer of Claim 4 wherein m and m' = 2.
6. The copolymer of Claim 2 wherein the monomer(s) of structure (ii) have X and X' = H, n and n' = 2; m and m' independently = 2 - 12; Ar and Ar' = phenyl; Z = C(CH₃)₂; and a is 1.
7. The copolymer of Claim 1 wherein the total amount of the monomer(s) of structure (i) is at least about 60% (wt.).
8. The copolymer of Claim 7 wherein the total amount of the monomer(s) of structure (i) is at least about 80% (wt.).
9. The copolymer of Claim 1 further comprising an ingredient selected from the group consisting of polymerization initiators, copolymerizable cross-linking monomers, and copolymerizable UV- and blue-light-blocking chromophores.
10. An ophthalmic lens consisting essentially of (i) one or more monomers having the structure:



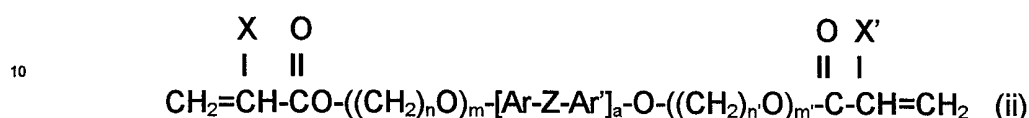
wherein: X is H or CH₃;

n is 0-10;

Y is nothing, O, S, or NR wherein R is H, CH₃, C_nH_{2n+1} (n=1-10) iso OC₃H₇, C₆H₅, or CH₂C₆H₅;

Ar is any aromatic ring which can be unsubstituted or substituted with H, CH₃, C₂H₅, n-C₃H₇, iso-C₃H₇, OCH₃, C₆H₁₁, Cl, Br, C₆H₅, or CH₂C₆H₅;

and (ii) one or more monomers having the structure:



wherein: X, X' are independently H or CH₃;

n, n' are independently 2 or 3;

m, m' are independently 2 - 25;

Ar, Ar' are independently as defined above;

a is 1 or 2; and

Z is C(CH₃)₂ or S(=O)₂.

11. The ophthalmic lens of Claim 10 wherein the monomer(s) of structure (i) have X = H; n = 2-4; Y = nothing or O; and Ar = phenyl.

12. The ophthalmic lens of Claim 11 wherein the monomer(s) of structure (i) are selected from the group consisting of 2-phenylethyl acrylate, 2-phenoxyethyl acrylate, 3-phenylpropyl acrylate, 3-phenoxypropyl acrylate, 4-phenylbutyl acrylate, and 4-phenoxybutyl acrylate.

13. The ophthalmic lens of Claim 10 wherein the monomer(s) of structure (ii) have X and X' = H, n and n' = 2; m and m' independently = 2 - 12; Ar and Ar' = phenyl; Z = C(CH₃)₂; and a is 1.

14. The ophthalmic lens of Claim 13 wherein m and m' = 2.

15. The ophthalmic lens of Claim 11 wherein the monomer(s) of structure (ii) have X and X' = H, n and n' = 2; m and m' independently = 2 - 12; Ar and Ar' = phenyl; Z = C(CH₃)₂; and a is 1.

5 16. The ophthalmic lens of Claim 10 wherein the total amount of the monomer(s) of structure (i) is at least about 60% (wt.).

17. The ophthalmic lens of Claim 16 wherein the total amount of the monomer(s) of structure (i) is at least about 80% (wt.).

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18. The ophthalmic lens of Claim 10 further comprising an ingredient selected from the group consisting of polymerization initiators, copolymerizable cross-linking monomers, and copolymerizable UV- and blue-light-blocking chromophores.

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19. The ophthalmic lens of Claim 10 wherein the ophthalmic lens is an intraocular lens optic.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 97/13971

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 C08F220/30 G02B1/04 C08F220/38 C08F220/34 C08F220/18

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 6 C08F G02B

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	FR 2 431 511 A (HOYA LENS CORP.) 15 February 1980 see claims 1,2 ---	1-19
A	EP 0 485 197 A (NESTLE SA.) 13 May 1992 cited in the application -----	

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Further documents are listed in the continuation of box C.

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Patent family members are listed in annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

information on patent family members

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