

INCREASED STIFFNESS CENTER OPTIC IN SOFT CONTACT LENSES **FOR ASTIGMATISM CORRECTION**

5 **BACKGROUND OF THE INVENTION**

1. Field of the Invention

10 The present invention relates to contact lenses having a higher stiffness in the central optic zone relative to the peripheral zone, and more particularly to soft contact lenses incorporating a higher modulus hydrogel material in the central optic zone relative to the peripheral zone for the correction of astigmatic refractive errors as well as possible higher order aberrations created by corneal geometry. The higher modulus hydrogel
15 material creates a stiffer central optic zone relative to the peripheral zone of the contact lenses. Other means and methods may also be utilized to create stiffer central optic zones.

20 2. Discussion of the Related Art

Myopia or nearsightedness is an optical or refractive defect of the eye wherein rays of light from an image focus to a point before they reach the retina. Myopia generally occurs because the eyeball or globe is too long or
25 the shape or contour of the cornea is too steep. A minus powered spherical lens may be utilized to correct myopia. Hyperopia or farsightedness is an optical or refractive defect of the eye wherein rays of light from an image focus to a point after they reach or behind the retina. Hyperopia generally occurs because the eyeball or globe is too short or the shape or contour of the
30 cornea is too flat. A plus powered spherical lens may be utilized to correct hyperopia. Astigmatism is an optical or refractive defect in which an individual's vision is blurred due to the inability of the eye to focus a point object into a focused image on the retina. Unlike myopia and/or hyperopia,

astigmatism is unrelated to globe size or corneal steepness, but rather it is caused by a non-rotationally symmetric cornea or from the misalignment or positioning of the crystalline lens. The vast majority of astigmatism occurs due to non-rotationally symmetric corneal curvature. A perfect cornea is rotationally symmetric whereas in most individuals with astigmatism, the cornea is not rotationally symmetric. In other words, the cornea is actually more curved or steeper in one direction than another, thereby causing an image to be stretched out rather than focused to a point. A cylindrical lens or toric contact lens, rather than a spherical lens may be utilized to resolve astigmatism.

Corneal astigmatism may be corrected using a hard or rigid gas permeable contact lens. In this case, a fluid or tear lens may exist between the posterior surface of the rigid contact lens and the cornea. This fluid or tear lens follows or assumes the shape of the back surface of the contact lens. Since the index of refraction of the fluid or tear lens is nearly a match for the cornea, the corneal toricity is optically neutralized or reduced. In these cases, a toric lens will not be required. However, rigid gas permeable contact lenses and hard contact lenses are generally less comfortable than soft or hydrogel contact lenses. Since soft or hydrogel contact lenses wrap around the cornea, a fluid lens is generally not found and the tear fluid more closely resembles a thin film. In this case, a toric lens design is required.

A toric lens is an optical element having two different powers in two orientations that are perpendicular to one another. Essentially, a toric lens has one power, spherical, for correcting myopia or hyperopia and one power, cylinder, for correcting astigmatism built into a single lens. These powers are created with curvatures at different angles which are preferably maintained relative to the eye. Toric lenses may be utilized in eyeglasses, intraocular lenses and contact lenses. The toric lenses used in eyeglasses and intraocular lenses are held fixed relative to the eye thereby always providing optimal vision correction. However, toric contact lenses may tend to rotate on the eye thereby temporarily providing sub-optimal vision correction.

Accordingly, currently utilized toric contact lenses also include a mechanism to keep the contact lens relatively stable on the eye when the wearer blinks or looks around. For many high order aberrations, many of which are not rotationally symmetric, positional stability is also required to provide optimal vision correction.

When a toric contact lens is first placed in the eye, it must automatically position or auto-position itself and it then maintains that position over time. However, once the toric contact lens is positioned, it tends to rotate on the eye due to the force exerted on the contact lens by the eyelids during blinking as well as eyelid and tear fluid movement. Maintenance of the on-eye orientation of a toric contact lens is generally accomplished by altering the mechanical characteristics of the toric contact lens. For example, prism stabilization, including decentering of the contact lens' front surface relative to the back surface, thickening of the inferior contact lens periphery, forming depressions or elevations on the contact lens' surface, and truncating the contact lens edge are all methods that have been utilized.

Each of more traditional stabilization techniques have advantages and disadvantages associated therewith. The main disadvantage of these types of designs is that they rely on the interaction of the eyelids and the contact lens' thickness differential to orient the contact lens to the correct location on the wearer's eye. The problem is particularly acute with plus powered toric contact lenses intended for hyperopia.

Accordingly, it would be advantageous to design contact lenses, including toric contact lenses, that correct for astigmatism as well as possible higher order aberrations caused by corneal geometry with less reliance on specific on-eye orientation and therefore less or no stabilization means.

SUMMARY OF THE INVENTION

The higher stiffness center optic contact lens design of the present invention overcomes a number of disadvantages associated with orientating and maintaining the orientation of toric contact lenses on a wearer's eye while providing visual acuity correction. The higher stiffness central optic zone contact lens may be achieved in a number of ways, including the addition of a material in the central optic zone having a higher modulus of elasticity than the surrounding material. In order to maintain its position in the central optic region, the higher modulus material preferably is immiscible or poorly miscible with the surrounding material.

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In accordance with one aspect, the present invention is directed to an ophthalmic device. The ophthalmic device comprising a contact lens having a central optic zone and a peripheral zone surrounding the central optic zone, the contact lens being formed from a first material having a first modulus of elasticity, and a second material incorporated into the central optic zone of the contact lens, the second material changing the first modulus of elasticity in the central optic zone to a second modulus of elasticity, wherein the second modulus of elasticity is greater than the first modulus of elasticity and the first and second materials are substantially immiscible.

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In accordance with another aspect, the present invention is directed to a method of making an ophthalmic device. The method comprising dosing a first material having a first modulus of elasticity into a center portion of a contact lens front curve mold, dosing a second material having a second modulus of elasticity into the contact lens front curve mold on top of the first material, wherein the second modulus of elasticity is greater than the first modulus of elasticity, and wherein the first and second materials are substantially immiscible, and positioning a contact lens back curve mold on the second material.

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In accordance with another aspect, the present invention is directed to a contact lens. The contact lens comprising an optic zone being formed from a material having a first modulus of elasticity, and a peripheral zone being

formed from a material having a second modulus of elasticity, wherein the first modulus of elasticity is greater than the second modulus of elasticity.

5 In accordance with yet another aspect, the present invention is directed to a contact lens. The contact lens comprising an optic zone having a first stiffness, and a peripheral zone having a second stiffness, the first stiffness being greater than the second stiffness.

10 In accordance with still another aspect, the present invention is directed to a method of making an ophthalmic device. The method comprising dosing an optical grade material a contact lens front curve mold, positioning a contact lens back curve mold on the optical grade material and sealing the contact lens front curve mold to the contact lens back curve to form a contact lens mold, and selectively curing the optical grade material in the contact lens mold by
15 varying the intensity of the curing light across the contact lens mold such that a central portion of the contact lens is stiffer than a peripheral portion of the contact lens.

20 In accordance with still yet another aspect, the present invention is directed to a method for making an ophthalmic device. The method comprising introducing a first reaction inhibitor into a surface of a contact lens front curve mold, dosing an optical grade material the contact lens front curve mold, introducing a second reaction inhibitor into a surface of a contact lens back curve mold, positioning the contact lens back curve mold on the optical grade
25 material and sealing the contact lens front curve mold to the contact lens back curve to form a contact lens mold, wherein the first and second reaction inhibitors differ in at least one of composition and concentration, and curing the optical grade material in the contact lens mold creating a predetermined tension profile through the resulting contact lens.

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Throughout the specification, the term stiffness should be understood to be a function of the elastic modulus of the material, the thickness of the material, the shape of the material, and any tension or stress built into the

material. Accordingly, for a given shape and a given thickness, a material with a higher modulus of elasticity will be stiffer than one with a lower modulus of elasticity.

5 The present invention is directed to a contact lens having an increased stiffness in the optic zone. This increased stiffness optic zone may be achieved in a number of ways, including utilizing a monomer with a higher modulus of elasticity than the bulk material forming the contact lens in the optic zone, utilizing a suitable additive for raising the modulus of elasticity in the optic
10 zone, by manufacturing the contact lens with specific processes such as varying cure light intensity across the lens thereby causing an increase in the stiffness of the center of the lens, or by pre-tensioning of the contact lens to create resistance to deformation when placed on-eye. By having a stiffer optical zone, the optic zone vaults over or does not conform to the astigmatic
15 geometry of the cornea while the remaining portion of the contact lens does. This vaulting or lack of conformation allows a tear or fluid lens to form between the cornea and the optic zone. This tear or fluid lens follows or assumes the shape of the back surface of the contact lens, which is rotationally symmetric or contains cylinder correction smaller than the corneal astigmatism. Since tears
20 have substantially the same index of refraction as that of the cornea, the fluid lens and the contact lens combination forms an optic surface or element that corrects all or a portion of the visual deficit or refractive error caused by the corneal geometry. In other words, since the index of refraction of the fluid or tear lens is nearly a match for the cornea, the corneal toricity is optically
25 neutralized or reduced when combined with the contact lens optics.

 The contact lens of the present invention may be manufactured utilizing any suitable process without a significant increase in expense or complexity. This design may be implemented in any number or type of soft contact lenses.
30 In one exemplary embodiment, the manufacturing process simply involves adding a material to the mold in the central optic region which has an elastic modulus higher than that of the remaining material forming the contact lens and which is immiscible or poorly miscible with the remaining material forming

the contact lens such that it remains fixed in the center region. In other exemplary embodiments, the increased stiffness central optic zone is manufactured by varying the cure light intensity across the contact lens and pre-tensioning the contact lens to create resistance to deformation.

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BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other features and advantages of the invention will be apparent from the following, more particular description of preferred
10 embodiments of the invention, as illustrated in the accompanying drawings.

Figure 1 is a planar view of a contact lens in accordance with the present invention.

15 Figure 2 is a diagrammatic representation of the steps to manufacture a contact lens in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

20 Contact lenses or contacts are simply lenses placed on the eye. Contact lenses are considered medical devices and may be worn to correct vision and/or for cosmetic or other therapeutic reasons. Contact lenses have been utilized commercially to improve vision since the 1950s. Early contact lenses were made or fabricated from hard materials, were relatively expensive
25 and fragile. In addition, these early contact lenses were fabricated from materials that did not allow sufficient oxygen transmission through the contact lens to the conjunctiva and cornea which potentially could cause a number of adverse clinical effects. Although these contact lenses are still utilized, they are not suitable for all patients due to their poor initial comfort. Later
30 developments in the field gave rise to soft contact lenses, based upon hydrogels, which are extremely popular and widely utilized today. Specifically, silicone hydrogel contact lenses that are available today combine the benefit of silicone, which has extremely high oxygen permeability, with the proven

comfort and clinical performance of hydrogels. Essentially, these silicone hydrogel based contact lenses have higher oxygen permeabilities and are generally more comfortable to wear than the contact lenses made of the earlier hard materials. However, these new contact lenses are not totally without
5 limitations.

Currently available contact lenses remain a cost effective means for vision correction. The thin plastic lenses fit over the cornea of the eye to correct vision defects, including myopia or nearsightedness, hyperopia or
10 farsightedness, astigmatism, i.e. asphericity in the cornea, and presbyopia i.e. the loss of the ability of the crystalline lens to accommodate. Contact lenses are available in a variety of forms and are made of a variety of materials to provide different functionality. Daily wear soft contact lenses are typically made from soft polymer-plastic materials combined with water for oxygen
15 permeability. Daily wear soft contact lenses may be daily disposable or extended wear disposable. Daily disposable contact lenses are usually worn for a single day and then thrown away, while extended wear disposable contact lenses are usually worn for a period of up to thirty days. Colored soft contact lenses use different materials to provide different functionality. For example, a
20 visibility tint contact lens uses a light tint to aid the wearer in locating a dropped contact lens, enhancement tint contact lenses have a translucent tint that is meant to enhance one's natural eye color, the color tint contact lens comprises a darker, opaque tint meant to change one's eye color, and the light filtering tint contact lens functions to enhance certain colors while muting others. Rigid gas
25 permeable hard contact lenses are made from silicone polymers but are more rigid than soft contact lenses, do not contain water, and thus hold their shape and are more durable, but generally less comfortable. Bifocal contact lenses are designed specifically for patients with presbyopia and are available in both soft and rigid varieties. Toric contact lenses are designed specifically for
30 patients with astigmatism and are also available in both soft and rigid varieties. Combination lenses combining different aspects of the above are also available, for example, hybrid contact lenses.

For purposes of the present invention a contact lens is defined by at least two distinct regions. The inner region or optical zone from which the vision correction is obtained and the outer peripheral zone of the contact lens that provides mechanical stability of the contact lens on eye. In some cases, an optional intermediate zone or region located between the inner optical zone and the outer peripheral zone may be used for blending the two aforementioned zones in a smooth manner such that discontinuities do not occur. A contact lens is also defined by a front surface or surface power, a back curve or base curve and an edge.

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The inner region or optical zone provides vision correction and is designed for a specific need such as single vision myopia or hyperopia correction, astigmatism vision correction, bi-focal vision correction, multi-focal vision correction, custom correction or any other design that may provide vision correction. The outer periphery or peripheral zone provides mechanical features which influence positioning and stabilization of the contact lens on the eye including, centration and orientation. Orientation stabilization is fundamental when the optical zone includes non-rotationally symmetric features, such as astigmatic correction and/or high order aberrations correction. The optional intermediate region or zone ensures that the optical zone and the peripheral zone are smoothly blended. It is important to note that both the optical zone and the peripheral zone may be designed independently, though sometimes their designs are strongly related when particular requirements are necessary. For example, the design of a toric lens with an astigmatic optical zone might require a particular peripheral zone for maintaining the contact lens at a predetermined orientation on the eye.

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Toric contact lenses have different designs than spherical contact lenses. The optical zone portion of toric contact lenses has two powers, spherical and cylindrical, created with curvatures generally at right angles to each other. The powers are required to maintain position at the specific angle, cylinder axis, on the eye to provide the required astigmatic vision correction. The mechanical or outer peripheral zone of toric contact lenses typically

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comprises a stabilization means to properly rotate and orient the cylindrical or astigmatic axis into position while being worn on the eye. Rotating the contact lens to its proper position when the contact lens moves, or when the contact lens is inserted is important in producing a toric contact lens.

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Referring now to Figure 1, there is illustrated a planar view of an exemplary contact lens design or construct in accordance with the present invention. The contact lens 100 comprises an optic zone 102 and a peripheral zone 104 surrounding the optic zone 102. This arrangement or configuration is a standard contact lens design. In accordance with the present invention; however, the optic zone 102 is modified, as detailed subsequently, to be stiffer than the surrounding region; namely, the peripheral zone 104. The optic zone 102 may be made stiffer than the peripheral zone 104 via a number of methods and means as is discussed subsequently. In one exemplary embodiment, the stiffer optic zone 102 may be achieved utilizing a material with a higher modulus of elasticity or higher elastic modulus in the optic zone 102 than the material in the peripheral zone 104. In addition to being of higher elastic modulus, the material in the optic zone 102 is preferably immiscible or poorly miscible with that of the surrounding material such that it remains fixed in position. A material with a higher elastic modulus is stiffer than a material with a lower elastic modulus. The stiffness of a component, element and/or part determines how much it will deflect under a given load. The more stiff a material is, the higher the load required to elastically deform it; however, it is important to note that the stiffness of an element is also a function of the material thickness as well as the shape of the element. Accordingly, for a given shape and thickness, the higher the modulus of elasticity, the greater the stiffness. With this type of design, astigmatic correction may be achieved via an increase in the contact lens stiffness for a rotationally or non-rotationally symmetric optic zone, in order to optically neutralize or reduce the effect of corneal astigmatism, by providing for the central optic or optic zone 102 of the contact lens 100 to vault over the astigmatic geometry of the cornea. In other words, the optic zone 102 vaults over, or does not conform to, the astigmatic geometry of the cornea while the peripheral zone 104 remains in contact with

the eye such that a thicker tear fluid lens forms between the cornea and the optic zone 102. Since tears have substantially the same index of refraction as that of the cornea, the tear fluid lens and the contact lens combination form an optic surface or element that corrects the visual deficit or refractive error caused by the corneal geometry. In other words, given that the index of refraction of the fluid or tear lens is nearly a match for the cornea; the corneal toricity is optically neutralized or reduced when combined with the contact lens optics. An advantage of the present invention is that in reducing or eliminating the need for the contact lens to contain non-rotationally symmetric optical correction, the stabilization features may be reduced in size or eliminated, thereby providing a more comfortable lens.

Based upon the specific stiffness achieved through this concept and the flexure of the high modulus hydrogel contact lens optic zone in combination with the specific lens geometry, for example, spherical, aspheric and/or toric, on top of an astigmatic corneal geometry, a contact lens designed in this manner may be utilized for the correction of low levels of astigmatism and also may be selectively utilized to enhance vision for higher amounts of astigmatism as well as any possible higher order aberrations created by corneal geometry. Accordingly, the present invention utilizes a contact lens with a specific prescription, but formed with an optic zone formed from a higher elastic modulus hydrogel material to correct optical defects with reduced or no need to maintain the lens rotationally aligned if rotational alignment would normally be required.

In order to realize this design, the optic zone 102 preferably comprises a material with higher modulus of elasticity and which is immiscible with or poorly miscible with the remaining material. In one exemplary embodiment, micro-dosing technology may be utilized to fabricate or manufacture a contact lens 100 having an optic zone 102 with a higher modulus of elasticity than the surrounding lens. Figures 2A-2D illustrates an exemplary process utilizing micro-dosing technology. In a first step, a standard front curve 202 for a given prescription is positioned to accept the material for forming a contact lens. In a

second step, a small drop of high elastic modulus clear monomer or clear additive to increase elastic modulus is dosed into the center portion of the contact lens front curve mold 202. In a third step, a second lower modulus monomer 206, for example, etafilcon, galyfilcon, senofilcon or narafilecon, is dosed on top of the high modulus monomer or additive 204. It is important to note that any suitable material for forming soft contact lenses may be utilized in accordance with the present invention. It is also important to note that the high elastic modulus material 204 and the low elastic modulus material 206 are immiscible or poorly miscible. In a fourth step, the contact lens mold is closed by the deposition of the base curve mold 208. The closed mold is then positioned so that the monomers may be cured into a final contact lens with a central optic or optic zone having a higher modulus of elasticity as is set forth above.

The materials set forth above for the bulk of the contact lens, including etafilcon, galyfilcon, senofilcon and narafilecon are silicone hydrogels that are currently utilized in the fabrication of soft contact lenses. Other silicone hydrogels include lotrafilcon, balafilcon, vifilcon and omafilecon. These materials typically have a low modulus of elasticity, for example, etafilcon A has a Young's modulus of about 0.3×10^6 Pa, galyfilcon A has a Young's modulus of about 0.43×10^6 Pa, senofilcon A has a Young's modulus of about 0.72×10^6 Pa, balafilcon A has a Young's modulus of about 1.1×10^6 Pa, and lotrafilcon A has a Young's modulus of about 1.4×10^6 Pa. The materials for the central optic preferably have a higher modulus of elasticity and are immiscible or poorly miscible with the material in the peripheral zone thereby allowing it to remain a bi-material contact lens. Exemplary materials include a silicone-based hydrogel in the center and a HEMA-based hydrogel in the periphery, which may be made poorly miscible and remain separated. In an alternate exemplary embodiment, one or more additives, including crosslinkers such as TEGDMA, may be added to the bulk material forming the contact lens in the central optic region to raise the modulus of elasticity in that region.

The more rigid or stiffer optical zone 102 materials and the less stiff peripheral 104 lens material do not necessarily have a distinct transition, as there may be a slight blending of the two materials during assembly. This would mean that the stiffness of the lens 100 may change gradually outside the optic zone, as a function of position from the center of the contact lens. Furthermore, the stiff optic zone 102 material would be continuous from the front surface of the central optic to the back surface of the central optic of the contact lens. This is different from a hybrid contact lens which encapsulates a rigid lens insert, inside of a soft lens material shell and has a distinct transition from stiff optic zone to softer periphery. This is also different from a skirted rigid gas permeable contact lens (RGP), since the periphery of the contact lens is not molded onto a rigid central optic, but rather the two materials are molded together, creating one non-homogenous soft contact lens.

It is important to note that any suitable biocompatible materials may be utilized to create the higher elastic modulus optic zone. The materials are preferably clear, are compatible with the monomer comprising the bulk of the contact lens and have the same index of refraction. Existing processes for forming contact lenses may be easily modified to manufacture contact lenses in accordance with the present invention. Viscosity differences in optic zone and periphery monomers may be used to maintain separation during the lens manufacturing process, such as in using a higher viscosity central monomer that does not flow outwards to the periphery when the lens mold is closed. Consideration must be made to the shrinkage and expansion rates of both materials in order to form an acceptable lens.

In accordance with another exemplary embodiment, a stiffer optic zone may be achieved through a controlled, but varied curing process. For example, by varying the cure light intensity across the contact lens, varying stiffness's may be realized in different regions. Accordingly, by selective curing, a stiffer optic zone relative to the peripheral zone may be achieved.

In addition to using a bi-material contact lens with differences in Young's modulus in the center and periphery or selective curing as described above, pre-tensioning of the lens may also create resistance to deformation when placed on-eye. A pre-tensioned lens will require more force to deform as the internal tension must be overcome along with the elastic force from the modulus, lens shape, and lens thickness. Methods of manufacturing pre-tensioned lenses include varying the reaction rate, such as by introducing different levels of oxygen or another reaction inhibitor, to the front and back surfaces of the lens molds. The result is a lens that, intact maintains a "dome" shape, but if cross-sectioned will tend to curl or flatten. In addition to exposing the entire front and back mold surfaces to different oxygen levels, the concentration of oxygen or another inhibitor may be varied across both front and back surfaces, creating a custom tension or stress profile through the lens.

The basic premise behind this pre-tensioning process is that different plastic mold materials absorb oxygen or other reaction inhibitors at different rates and retain the oxygen or other reaction inhibitors with different affinities. By utilizing different materials to form the front and back curve molds or selectively exposing the front and/or back curve molds to oxygen or other reaction inhibitors, the reaction rate may be changed thereby inducing stresses in the contact lens. For example, polypropylene readily absorbs oxygen while zeonor and polystyrene absorb significantly less. Accordingly, by utilizing polystyrene for the front curve mold and polypropylene for the back curve mold, with equal access to oxygen, the back curve mold will absorb more oxygen than the front curve mold and thus the monomer in contact with this surface will have different properties, creating a differential stress between the front and back surfaces of the contact lens. The concentration of the oxygen or other reaction inhibitors may be further manipulated by controlling at least one of, all of, or any combination of time, temperature, concentration and pressure of the medium (environment) surrounding the front and back curve mold surfaces. In addition, concentration of absorbed oxygen or other reaction inhibitors may be varied across the surface, such as by masking the part prior to exposure or selectively removing absorbed gases.

Providing that the corneal astigmatism is effectively reduced per this design with a rotationally symmetric optic due to the increased stiffness of the soft contact lens by means of the increased modulus of elasticity in the central
5 optic or optic zone or by any other suitable means such as varying cure light intensity and pre-tensioning of the contact lens as described in detail herein, the contact lens would not require any specific on eye orientation and therefore less or no mechanical stabilization for the contact lens. If corneal astigmatism and/or high order aberrations are reduced, but not made negligible, mechanical
10 stabilization may still be required, but variations in lens position will have a smaller impact on visual quality. As set forth above, an advantage of the present invention is that the stabilization features may be reduced in size or substantially eliminated, thereby providing a more comfortable contact lens. The present invention offers a simple and elegant solution for the correction of
15 astigmatism.

Although shown and described is what is believed to be the most practical and preferred embodiments, it is apparent that departures from specific designs and methods described and shown will suggest themselves to
20 those skilled in the art and may be used without departing from the spirit and scope of the invention. The present invention is not restricted to the particular constructions described and illustrated, but should be constructed to cohere with all modifications that may fall within the scope of the appended claims.

CLAIMS

1. A method of making a contact lens having a central optic zone with a higher modulus of elasticity than a peripheral zone, the method comprising:
 - a) introducing a first reaction inhibitor into a surface of a contact lens front curve mold;
 - b) dosing a first material having a first modulus of elasticity into a center portion of the contact lens front curve mold;
 - c) dosing a second material having a second modulus of elasticity into the contact lens front curve mold on top of the first material, wherein the second modulus of elasticity is greater than the first modulus of elasticity, and wherein the first and second materials are substantially immiscible;
 - d) introducing a second reaction inhibitor into a surface of a contact lens back curve mold, wherein the first and second reaction inhibitors differ in at least one of composition and concentration; and
 - e) positioning the contact lens back curve mold on the second material and curing the first and second materials.
2. The method of making a contact lens according to Claim 1, wherein the first and second reaction inhibitor comprises a gas.
3. The method of making a contact lens according to Claim 2, wherein the gas is oxygen.
4. The method of making a contact lens according to Claim 1, further comprising a step of controlling the concentration of the first and second reaction inhibitors by varying the materials forming the front and back curve molds by their propensity to absorb and release the first and second reaction inhibitors respectively.
5. The method of making a contact lens according to Claim 1, further comprising a step of controlling the concentration of the first and second reaction inhibitors by varying the exposure to the first and second inhibitor by controlling the time, temperature, concentration and pressure of the medium surrounding the front

and back curve molds.