CLAIMS

1. A method for preparing an aspheric vision correction lens with controllable peripheral defocus, characterized in comprising the following steps:

(1) calculating and determining the conditions required for the formation of myopic defocus of a human eye, by measuring a shape of the retina of the human eye, an amount of peripheral defocus of the naked human eye or an amount of peripheral defocus of the human eye in case a trial lens is worn;

(2) determining refractive powers of different apertures of the vision correction lens, according to the conditions obtained for myopic defocus; and

(3) making the vision correction lens according to the distribution of the refractive power of the vision correction lens obtained in step (2) such that after the refractive power of the vision correction lens is added to the human eye, the distribution of the refractive power of the optical system formed by the naked eye together with the vision corrective lens on the retina is greater in the peripheral region of the retina than in the central region of the retina, and a focus is formed in front of the retina, to form myopic defocus.

2. The method for preparing an aspheric vision correction lens according to claim 1, characterized in that, in said step (1), the shape of the retina of the human eye is measured by an ophthalmic test apparatus; if the ophthalmic test apparatus deems the retina as a spherical surface, the shape of the retina is measured by the radius of curvature of the retina; if the ophthalmic test apparatus deems the retina as an aspheric surface, the shape of the retina is measured by the equivalent radius of curvature of the aspheric surface; the equivalent radius of curvature of the aspheric surface is calculated in the following way:

$$r_m = \frac{\left(\frac{d_m}{2}\right)^2 + h_m{}^2}{2h_m} = \frac{(d_m)^2 + 4h_m{}^2}{8h_m},$$

wherein m is a point on the aspheric surface; r_m is the equivalent radius of

curvature at point m; d_m is twice the radial distance between m and the vertex of the aspheric surface; h_m is the axial distance between m and the vertex of the aspheric surface.

3. The method for preparing an aspheric vision correction lens according to claim 1 or 2, characterized in that, in said step (2), the refractive power distribution of the entire optical system formed by the vision corrective lens together with the naked eye meets the condition for myoptic defocus:

$$\left|\frac{1}{D_t'}\right| < \left|\frac{1}{D_r}\right| = \left|\frac{1}{D_0} - r + \sqrt{R^2 - r^2}\right|$$

wherein D_t' is the refractive power of a aperture of the entire optical system; D_r is the refractive power of the same aperture of the naked eye; D_0 is the paraxial refraction of naked eye; r is the size of the aperture; R is the radius of curvature or equivalent radius of curvature of the retina at the aperture.

4. The method for preparing an aspheric vision correction lens according to claim 1 or 2, characterized in that, the shape of the retina is measured by an optical coherence tomograph OCT.

5. The method for preparing an aspheric vision correction lens according to claim 1, characterized in that, in said step (1), the amount of peripheral defocus of the naked human eye (ΔD1) and the amount of peripheral defocus in case a trial lens is worn (ΔD3) are both measured by an ophthalmic test apparatus; the design of the trial lens is certain, which means that the amount of peripheral defocus of the trial lens (ΔD2) is known; when the amount of peripheral defocus provided by the trial lens (ΔD2) plus the amount of peripheral defocus of the naked human eye (ΔD1) is greater than 0, it indicates that the human eye can form myopic defocus; or when the amount of peripheral defocus of the human eye in case a trial lens is worn (ΔD3) is greater than 0, it also indicates that the amount of peripheral defocus of the trial lens meets the conditions for myopic defocus.

6. The method for preparing an aspheric vision correction lens according

to claim 1, characterized in that, when the amount of peripheral defocus of the human eye in case a trial lens is worn (ΔD3) is less than or equal to 0, it indicates that the amount of defocus of the lens still puts the human eye in a state of hyperopic peripheral defocus, and the amount of defocus of the lens needs to be increased in order for the human eye to achieve myopic peripheral defocus.

7. The method for preparing an aspheric vision correction lens according to any one of claims 1, 2, 5 and 6, characterized in that, the amount of peripheral defocus of the lens is increased or decreased according to the patient's own physiological condition and requirement for the extent of myopia control, to achieve custom vision correction.

8. The method for preparing an aspheric vision correction lens according to claim 1, characterized in that, in said step (3), according to the distribution of the refractive power obtained in step (2), a vision correction lens is made using an aspheric design method, the expression of the aspheric surface being:

$$Z(y)=\frac{cy^2}{1+\sqrt{1-(1+Q)c^2y^2}}+\sum_{i=2}^{5}A_{2i}\bullet y^{2i}$$

wherein Z(y) is an expression of the curve of the aspheric surface of the vision correction lens on the plane YZ, c is the reciprocal of the radius of curvature of the base spherical surface of the optical zone, y is the vertical distance from any point on the curve to the abscissa axis (Z), Q is aspheric coefficient, A_{2i} is aspheric high-order term coefficient, and the points on the aspheric surface are obtained from the curve through rotationally symmetric variation about the abscissa axis (Z);

through adjustment of the Q value and aspheric high-order term coefficients of the vision correction lens, the surface of the vision correction lens exhibits different equivalent curvatures in different radial portions, and the equivalent curvature changes uniformly, continuously and smoothly without abrupt change throughout the optical zone, so that the vision correction

lens has, at different apertures, a refractive power adapted to the refractive power distribution of myopic defocus, with the refractive power in the peripheral region being greater than the refractive power in the central region;

the equivalent radius of curvature is described by:

$$r_m = \frac{\left(\frac{d_m}{2}\right)^2 + h_m{}^2}{2h_m} = \frac{(d_m)^2 + 4h_m{}^2}{8h_m},$$

wherein m is a point on the aspheric surface; r_m is the equivalent radius of curvature at point m; d_m is twice the radial distance between m and the vertex of the aspheric surface; h_m is the axial distance between m and the vertex of the aspheric surface.

9. An aspheric vision correction lens, the vision correction lens being a correction lens worn outside the eye, characterized in that, at least one of a convex surface or a concave surface of an optical zone of the lens is aspheric; when the convex surface of the optical zone of the lens is aspheric, an absolute value of the equivalent radius of curvature of the periphery of the optical zone of the lens is smaller than an absolute value of the radius of curvature of the center of the optical zone of the lens; and when the concave surface of the optical zone of the lens is aspheric, an absolute value of the equivalent radius of curvature of the periphery of the optical zone of the lens is greater than an absolute value of the radius of curvature of the center of the optical zone of the lens.

10. The vision correction lens according to claim 9, characterized in that a shape of the aspheric surface of the optical zone of the lens is defined by a scale factor η of equivalent radii of curvature, η being a ratio of r at different apertures d_m and d_n, wherein m> n,

$$\eta_{mn} = \frac{r_m}{r_n}$$

the equivalent radius of curvature of the optical zone of the lens is calculated in the following way:

$$r_m = \frac{\left(\frac{d_m}{2}\right)^2 + h_m{}^2}{2h_m} = \frac{(d_m)^2 + 4h_m{}^2}{8h_m},$$

wherein m is a point on the aspheric surface; r_m is the equivalent radius of curvature at point m; d_m is twice the radial distance between m and the vertex of the aspheric surface; h_m is the axial distance between m and the vertex of the aspheric surface, and wherein r_n is the equivalent radius of curvature at point n, the calculation of r_n refers to r_m;

when the concave surface of the optical zone of the lens is an aspheric surface, the scale factor η of the equivalent radii of curvature of the aspheric surface is greater than 1, the scale factor η_{53} of the equivalent radii of curvature of the aspheric surface at a 5mm aperture and a 3mm aperture being greater than or equal to 1.002 and less than or equal to 1.086; when the convex surface of the optical zone of the lens is an aspheric surface, the scale factor η of the equivalent radii of curvature of the aspheric surface is less than 1, the scale factor η_{53} of the equivalent radii of curvature of the aspheric surface at the 5mm aperture and the 3mm aperture being greater than or equal to 0.682 and less than or equal to 0.986.

11. The vision correction lens according to claim 9, characterized in that the refractive power of the lens in the air is less than or equal to 0D; the refractive power of the lens increases radially as the aperture increases, and the absolute value of the refractive power of the lens decreases as the aperture increases.

12. The vision correction lens according to claim 11, characterized in that the difference between the refractive power of the lens at the 5mm aperture and the refractive power of the lens at the 3mm aperture ΔD_{53} is greater than or equal to 0.005D.

13. The vision correction lens according to claim 12, characterized in that the difference between the refractive power of the lens at the 5mm aperture and the refractive power of the lens at the 3mm aperture ΔD_{53} is greater than or equal to 0.005D and less than or equal to 8.849D.

14. An aspheric vision correction lens, the vision correction lens being an orthokeratology lens, characterized in that, the shape of the aspheric surface of the base curve zone of the lens is defined by a scale factor η of equivalent radii of curvature; the scale factor η of the equivalent radii of curvature of the aspheric surface is less than 1; the scale factor η_{53} of the equivalent radii of curvature of the aspheric surface of the base curve zone of the lens at a 5mm aperture and a 3mm aperture is greater than or equal to 0.67 and less than 1;

scale factor η is a ratio of r of the lens at different diameters d_m and d_n, wherein m> n,

$$\eta_{mn} = \frac{r_m}{r_n}$$

the equivalent radius of curvature of the base curve zone of the lens is calculated in the following way:

$$r_m = \frac{\left(\frac{d_m}{2}\right)^2 + h_m{}^2}{2h_m} = \frac{(d_m)^2 + 4h_m{}^2}{8h_m},$$

wherein m is a point on the aspheric surface; r_m is the equivalent radius of curvature at point m; d_m is twice the radial distance between m and the vertex of the aspheric surface; h_m is the axial distance between m and the vertex of the aspheric surface, and wherein r_n is the equivalent radius of curvature at point n, the calculation of r_n refers to r_m.

15. The vision correction lens according to claim 14, characterized in that the scale factor η_{53} of the equivalent radii of curvature of the aspheric surface of the base curve zone of the lens at a 5mm aperture and a 3mm aperture is greater than or equal to 0.67 and less than or equal to 0.998.

16. An aspheric vision correction lens, the vision correction lens being an intraocular lens, characterized in that, at least one of an anterior surface or a posterior surface of an optical zone of the lens is an aspheric surface; the refractive power of the lens increases as the aperture increases, and an absolute value of the refractive power decreases as the aperture increases, and the refractive power changes uniformly, continuously and smoothly without

abrupt change; and the refractive power of the lens in the aqueous humor is less than or equal to 0D.

17. The aspheric vision correction lens according to claim 16, characterized in that, the shape of the aspheric surface of the optical zone of the lens is defined by a scale factor η of equivalent radii of curvature, the scale factor η of the equivalent radii of curvature of the aspheric surface is greater than 1; the scale factor η_{43} of the equivalent radii of curvature of the aspheric surface of the optical zone of the lens at a 4mm aperture and a 3mm aperture is greater than or equal to 1.005;

scale factor η is a ratio of r of the lens at different diameters d_m and d_n, wherein m> n,

$$\eta_{mn} = \frac{r_m}{r_n}$$

the equivalent radius of curvature of the optical zone of the lens is calculated in the following way:

$$r_m = \frac{\left(\frac{d_m}{2}\right)^2 + h_m{}^2}{2h_m} = \frac{(d_m)^2 + 4h_m{}^2}{8h_m},$$

wherein m is a point on the aspheric surface; r_m is the equivalent radius of curvature at point m; d_m is twice the radial distance between m and the vertex of the aspheric surface; h_m is the axial distance between m and the vertex of the aspheric surface, and wherein r_n is the equivalent radius of curvature at point n, the calculation of r_n refers to r_m.

18. The aspheric vision correction lens according to claim 17, characterized in that the scale factor η_{43} of the equivalent radii of curvature of the aspheric surface of the optical zone of the lens at a 4mm aperture and a 3mm aperture is greater than or equal to 1.002 and less than or equal to 1.09.