

WE CLAIM:

1. A photo-responsive shape changing polymer composition comprising:
 - a) a photoinitiator that absorbs light in the wavelength range of about 400 nm to about 700 nm;
 - b) a cross-linked polymer matrix; and
 - c) a polymerizable composition;wherein, exposing photo-responsive shape changing polymer composition to a photobleaching dose of light, in the wavelength range of about 400 nm to about 700 nm, significantly photobleaches the photo-responsive shape changing polymer composition.
2. The photo-responsive shape changing polymer composition of claim 1, further comprises a hydrogen donor.
3. The photo-responsive shape changing polymer composition of claim 1, further comprises an electron donor.
4. The photo-responsive shape changing polymer composition of claim 1, wherein the photoinitiator is selected from the group consisting of thioxanthone fluorenones, anthraquinone, xanthenic dyes and derivatives, acridines and its derivatives, pyrromethenes and derivatives, Polymethines, squarylium and its derivatives, julolidines and derivatives, and combinations thereof.
5. The photo-responsive shape changing polymer composition of claim 4, wherein the photoinitiator comprises 2 ethyl hexyl ester of Eosin-Y.
6. The photo-responsive shape changing polymer composition of claim 1, wherein the cross-linked polymer matrix comprises a mono unsaturated monomer and a cross-linker.
7. The photo-responsive shape changing polymer composition of claim 1, wherein the cross-linked polymer matrix comprises a mono unsaturated monomer and a macromer.
8. The cross-linked polymer matrix of claim 6, wherein the mono unsaturated monomer is selected from 2 ethyl hexyl acrylate, butyl acrylate, butyl methacrylate, ethyl acrylate, ethyl methacrylate, 2ethyl hexyl methacrylate, isobutyl acrylate, t butyl acrylate, octyl acrylate, octyl methacrylate.

9. The cross-linked polymer matrix of claim 6, wherein the cross-linker is selected from ethylene glycol dimethacrylate, hexane diol diacrylate, ED 20 acrylate, trimethylol propane triacrylate, dipentaerythritolhexa acrylate, glycerol triacrylate.
10. The cross-linked polymer matrix of claim 7, wherein the macromer is selected from Ma1 and Ma2.
11. The photo-responsive shape changing polymer composition of claim 1, wherein the cross-linked polymer matrix has a glass transition temperature in the range from about - 70°C to about 10°C.
12. The photo-responsive shape changing polymer composition of claim 1 has a glass transition temperature in the range from about - 40°C to about 10°C.
13. The photo-responsive shape changing polymer composition of claim 1, wherein the polymerizable composition comprises a monomer.
14. The photo-responsive shape changing polymer composition of claim 13, wherein the polymerizable composition comprises a monomer selected from 2 ethyl hexyl acrylate, decyl acrylate, lauryl acrylate..
15. The photo-responsive shape changing polymer composition of claim 1, wherein the polymerizable composition comprises a cross-linker.
16. The photo-responsive shape changing polymer composition of claim 15, wherein the cross-linker is selected from ethylene glycol dimethacrylate, hexane diol diacrylate, ED 20 acrylate, trimethylol propane triacrylate, dipentaerythritolhexa acrylate, and glycerol triacrylate.
17. The photo-responsive shape changing polymer composition of claim 1, wherein the polymerizable composition comprises a macromer.
18. The photo-responsive shape changing polymer composition of claim 17 wherein the macromer is selected from Ma1 and Ma2.
19. The macromer as claimed in claim 18, wherein the macromer has a number average molecular weight is in the range 225 to 10,000.

20. The photo-responsive shape changing polymer composition of claim 2, wherein the hydrogen donor is selected from N phenyl glycine, benzyltrimethylstannanes, thiols, arylsulfonates, sulfur compounds, 1,3-diketone enolates, phosphines, carboxylates, borates, organotin, and amino acids (in the presence of phenoxazines), hydroxyl acrylates, hydroxyl methacrylates, ascorbic acid.
21. The photo-responsive shape changing polymer composition of claim 20, wherein the hydrogen donor is selected from hydroxyl acrylates.
22. The photo-responsive shape changing polymer composition of claim 20, wherein the hydrogen donor is selected from ascorbic acid, ascorbic acid esters, ascorbic acid amides.
23. The photo-responsive shape changing polymer composition of claim 20, wherein the hydrogen donor concentration in the range from about 0.001% to about 10% wt by wt of photo-responsive shape changing polymer composition.
24. The photo-responsive shape changing polymer composition of claim 3, wherein the electron donor is in the concentration range of about 0.01% to about 10% wt by wt of photo-responsive shape changing polymer composition.
25. The photo-responsive shape changing polymer composition of claim 3, wherein the electron donor is selected from the group comprising of aliphatic or aromatic primary, secondary, tertiary amines with a backbone of diphenyliodonium chloride, N phenyl glycine (NPGs), benzyltrimethylstannanes, thiols, arylsulfonates, sulfur compounds, 1,3-diketone enolates, phosphines, carboxylates, borates, organotin, and amino acids (in the presence of phenoxazines).
26. The photo-responsive shape changing polymer composition of claim 24, wherein the electron donor comprises dimethyl aminoethyl methacrylate.
27. The photo-responsive shape changing polymer composition of claim 1, wherein exposing the composition to a dose of light, in the wavelength range of about 400 nm to about 700 nm, further changes the shape of the polymer composition by inducing the photoinitiator to cause photopolymerization of the polymerizable composition.

28. The photo-responsive shape changing polymer composition as claimed in claim 27 wherein on exposure to the light in the range of about 400 nm to about 700 nm, the changes in the shape of the polymer composition result in changes in rms value of higher order aberrations in the range 0.001 microns to 25 microns in air.
29. The photo-responsive shape changing polymer composition as claimed in claim 27 wherein on exposure to the light in the range of about 400 nm to about 700 nm, the changes in the shape of the polymer composition result in changes in rms value of higher order aberrations in the range 0.01 microns to 0.5 microns in air.
30. The photo-responsive shape changing polymer composition of claim 1, wherein by exposing to a lock-in dose of light, in the wavelength range of about 400 nm to about 700 nm, the refractive properties of the polymer composition are locked in.
31. The photo-responsive shape changing polymer composition of claim 30, wherein the lock-in dose of light lies in the range from about 100 millijoules/cm² to about 50 Joules/cm².
32. The photo-responsive shape changing polymer composition of claim 1, wherein the photobleaching dose of light lies in the range 100 millijoules/cm² to 50 Joules/cm².
33. The photo-responsive shape changing polymer composition of claim 1, wherein the photobleaching dose of light is 1.5 to 20 times greater than the lock-in dose of light.
34. The photo-responsive shape changing polymer composition of claim 1, wherein the photobleaching dose of light is substantially same as the lock-in dose of light.
35. The photo-responsive shape changing polymer composition of claim 1, wherein the photobleaching dose of light is 1.01 to 1.4 times greater than the lock-in dose of light.
36. The photo-responsive shape changing polymer composition of claim 1, wherein the photo-responsive shape changing polymer composition is fabricated into an intraocular lens.
37. The intraocular lens as claimed in claim 36, wherein the exposure of the intraocular lens to light in the wavelength range from about 400 nm to about 700 nm causes change in spherical power of the intraocular lens in the range 0.1 to 50 diopters in air.

38. The intraocular lens as claimed in claim 36, wherein the exposure of the intraocular lens to light in the wavelength range from about 400 nm to about 700 nm causes change in spherical power of the intraocular lens in the range 0.25 to 20 .diopters in air.
39. The intraocular lens as claimed in claim 36, wherein the exposure of the intraocular lens to light in the wavelength range from about 400 nm to about 700 nm causes change in cylindrical power of the intraocular lens in the range 0.1 to 50 diopters in air.
40. The intraocular lens as claimed in claim 36, wherein the exposure of the intraocular lens to light in the wavelength range from about 400 nm to about 700 nm causes change in cylindrical power of the intraocular lens 0 in the range 0.25 to 20 diopters in air.
41. The photo-responsive shape changing polymer composition of claim 1, is a colored intraocular lens.
42. A colored intraocular lens comprising;
- a. photoinitiator that absorbs light, in the wavelength range of about 400 nm to about 700 nm,
 - b. a cross-linked polymer matrix , and
 - c. a polymerizable composition;
- wherein, the colored intraocular lens can be significantly photobleached by exposing to a photobleaching dose of light in the wavelength range of about 400 nm to about 700 nm.
43. A method of implementing a colored intraocular lens comprising a photo-responsive shape changing polymer composition, and implanted within an eye, comprising:
- a.) exposing at least a portion of the colored intraocular lens to light in the wavelength range of about 400 nm to about 700 nm, results in the change in the shape of the lens manifested in refractive properties of the lens
 - b). exposing at least a portion of the colored intraocular lens to a lock-in dose of light, in the wavelength range of about 400 nm to about 700 nm, so as to lock the refractive properties of the lens

- c) exposing at least a portion of the colored intraocular lens to a photobleaching dose of light, in the wavelength range of about 400 nm to about 700 nm, so as to cause significant photobleaching; and
- d) producing a significantly photobleached colorless intraocular lens having locked-in refractive properties.