

CONTACT AND INTRAOCULAR LENSES, THEIR MANUFACTURE, AND OPTICAL BEHAVIOR

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Application of contact and intraocular lenses in large extent is dated from the introduction of their manufacture from soft, hydrophilic, oxygen-permeable, and biocompatible polymer materials since 1960. Generally, there are three technologies, i.e. the polymerization in closed molds (cast molding), in rotating open molds (spin casting), and lathe cutting from the hard xerogel. Any of these methods brought some limitation from the viewpoint of the lens shape and therefore its optical properties. Of course, the contemporary technique employing CNC machines has opened a vast opportunity for the lens shape optimization.

Nevertheless, optical behavior of the contact lenses should be considered from the different viewpoint in comparison with the optical properties of the glasses or other optical equipment. It is evident that they become intrinsic part of the eye as a sensor. The reason, why an object picture is perceived as continuous goes to the account of brain processing of separate signals of particular "digital pixels" obtained by the simplest sensors – rods and cones on the retina. Their spacing corresponds to 1' (angular minute) on the object side (e.g. 1 mm spacing in the distance 3 m), which is a limit of the perception with an unaided eye. Moreover, the sharp image does not cover more than 30' of the object; the other space is covered by the vague peripheral image only. This is one reason for visual illusions; the other is based on the adaptation to the perception of dark and bright objects. On the other side, due to this limitation the eye perception can work satisfactorily even with an incorrect optics. Surprisingly, the optical inaccuracy of contact and intraocular lenses may be under some circumstances profitable.