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Intraocular Lens (IOL) Testing

Material selection, fabrication, inspection, quality control

Q Question

- I am a chemical engineer in research and development, how do I evaluate the performance of a new IOL polymer material and production process?
- I am the director of manufacturing, how does my team reliably inspect incoming materials and the optical characterization of outgoing IOL batches for shipment?
- I am a quality assurance technician, how do I accurately compare, validate, and select different polymer IOL batches?

A Answer

Refractometry: precise validation of refractive index at multiple wavelengths

Background: IOLs are artificial implanted lenses which are used to replace or enhance the natural crystalline lens of the eye by helping focus light onto the retina. The geometrical shape of the IOL along with the **refractive index** of the base polymer material determines the focusing power or diopter of the IOL.

The most common application of IOLs is for treating cataracts when the eye's natural lens becomes cloudy and hard and needs to be replaced. IOLs are also frequently combined with the existing natural lens to change the eye's focusing power to treat near-sightedness (myopia).

The base polymer material of an IOL plays a key role in comfortability and function for the patient but also in how the IOL is optically characterized. For example, there are hydrophobic lenses which are made of water-repellent plastics such as PMMA, silicone, or acrylic EMA EOEMA. Although they retain a natural elasticity, they also have a much harder surface. Alternatively, there are softer, water absorbing hydrophilic lenses that are made of HEMA-based water attracting materials.

Refractometry: The focusing power of an IOL is dependent upon both the base polymer material properties and the fabrication process of the lens into its solid form. Refractometry, a measurement of refractive index, is the key to evaluating the optical characteristics of a liquid polymer, the fabrication process of a solid IOL, and the inspection of IOL batches.

Refractometer: ATR-L

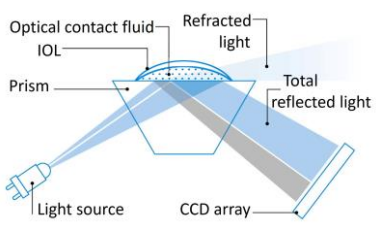
The refractive index of a material varies with temperature and by wavelength, thus creating a unique spectral profile, a fingerprint, of the material across the visible light spectrum (450 - 720 nm). A single wavelength measurement is inadequate to make a meaningful evaluation. For accurate and reliable material profiling, multiple wavelength measurements, such as from the **Schmidt + Haensch ATR-L Multiple Wavelength Refractometer** is needed to clearly characterize and feel confident in your IOL materials, production processes, and quality control.

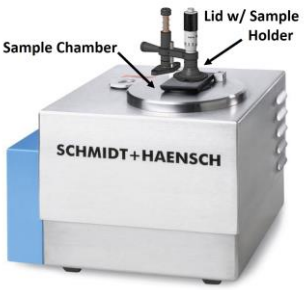
S
Solution

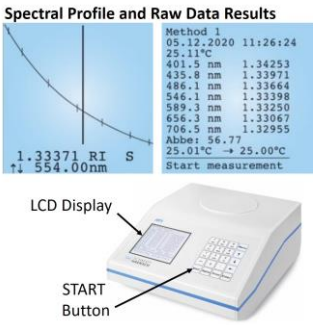
The ATR-L is the solution for accurate refractive index profiling of IOLs

Schmidt + Haensch's ATR-L is the perfect laboratory and production refractometer for fully automated multiple wavelength IOL refractive index measurements. Measurements are taken at 7 discrete wavelengths, which can be customer configured. A refractive index profile across the entire visible spectrum is achievable with interpolation. The instrument comes equipped with an internal Peltier temperature controller guaranteeing fast and high accuracy measurements without the need of an external water bath and thermostat.

IOL Measurement Procedure: Training employees to use the ATR-L is simple and fast after a short introduction to the instrument.







1. Load an IOL into the sample chamber by placing the hollow (concave) side of the lens in contact with the prism and an optical contact index matching fluid. No contact fluid required for a liquid polymer sample or for hydrophilic IOLs.
2. Close the sample chamber lid. Use the (optional) micrometer lid to apply precision pressure and alignment of IOL samples to the prism. The micrometer is not required for liquid polymer samples and is interchangeable.
3. Use the controller to select the desired measurement temperature and settings. When temperature is reached, Press Start. Spectral Profile and Raw Data Results are available on the LCD Screen and can be exported to a PC or Printer.

Specifications	ATR-L Refractometer
Product Package	Instrument with Display and PC/Printer Communication
Highlights	Automatic dispersion measurement at 7 wavelengths over the full visible spectrum; Internal Peltier temperature control guarantees the fastest measurements with highest accuracy

Schmidt + Haensch Products used
- ATR-L (Code: ATR-L)

Recommended Accessories
- Lid w/ precision alignment/pressure tool (Code: ATR-A1)
- Certified Reference Materials (Code: CRM-R)

Benefits
- Cost and Time savings
- Accurate, Fast and Precise Measurements
- Reliable Product Quality Screening

Solutions
- Determination of product purity
- Quality control
- Product fingerprinting
- Optical material characterization

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