Pressure-Sensitive Hydrogels for Measuring Intraocular Pressure In-Situ

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Technology description

Changes Color in Response to Different Pressure Levels Exerted Inside the Eye

This bio-compatible pressure-sensitive hydrogel coating applied to or embedded in existing ocular implants provides direct and continuous measurement of intraocular pressure. Ophthalmologists measure intraocular pressure to diagnose and treat eye diseases such as glaucoma, ocular hypertension or hypotony. However, available ocular pressure measurement methods don’ t directly measure internal pressure, but instead involve external contact with the eye to approximate the pressure inside the eye. Likewise, available contact lenses that measure pressure require calibration both before and after placement, require power and data transmission, can cause discomfort when worn, and return variable results based on the physical properties of a patient’ s ocular wall. Researchers at the University of Florida have developed a bio-compatible material to coat onto or embed into ocular implants, such as intraocular lenses or glaucoma drainage tubes, placed into the eye for numerous clinical reasons. This pressure-responsive hydrogel changes color in response to different pressure levels, allowing qualitative monitoring by spectral analysis using currently available smartphones and apps. Therefore, patients and medical professionals can rely on this smart material for an effective non-contact method of direct intraocular pressure measurement throughout the day.

Technology

This material uses chromogenic photonic crystals that change color depending on the level of pressure exerted onto the lens inside the eye. Different hydrogel colors can directly correlate to various ranges of interocular pressure: normal (about 10 - 20 mm Hg), elevated (about 20 - 30mm Hg or more) and reduced (about 4 mm - 10 mm Hg or less). Manufacturers of ocular implant devices, such as drainage stents, tubes, intraocular lenses or prosthetics could apply the coating or incorporate it onto any component of the implant. Once implanted, practitioners can then observe the color of the pressure-sensitive hydrogel by using an ophthalmoscope or otoscope. Additionally, practitioners can monitor the color by spectral analysis, using a handheld spectrometer, or other generally available device, combined with a smartphone app. Either way, this hydrogel allows continuous, direct, and noninvasive ocular pressure monitoring without the need for dilation or external contact with the eye.

Application area

Pressure-sensitive, chromogenic, bio-compatible hydrogel for ocular implants to directly measure intraocular pressure

Advantages

Measures eye pressure directly inside of the eye, ensuring accurate measurement
Coats or embeds into existing ocular implants, obviating the separate and possibly uncomfortable placement of a contact lens or other external device
Measures continually throughout the day, allowing continual ocular pressure monitoring
Requires no eye dilation, making pressure measurement accessible at any time

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