

Simultaneous Corneal Hydration Thickness And Hydration Measurement Through Multi-Spectral Reflectometry

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SUMMARY

UCLA Researchers in the Department of Bioengineering have developed a novel technology to simultaneously detect changes in thickness and hydration levels of the cornea.

BACKGROUND

Regulating water content is a major component of corneal biology as it is essential in transmission and focusing properties of the cornea and hydration levels of the cornea are indicative of cornea pathology. Fuchs dystrophy is a slowly progressing corneal dystrophy that causes the cornea to hyperhydrate and affects up to 4% of the population over 40, or approximately 5.7 million adults in the US. Currently the only cure for Fuchs dystrophy is corneal transplant, however, better diagnostic techniques which enabled early detection of disease progression could delay the need for surgery. Current practices limit corneal tissue water content (CTWC) measurement to central corneal thickness (CCT) and are extrapolated to outer regions. These diagnostic techniques assume that corneal hydration levels correlate with CCT which is not true, therefore, corneal hydration detection methods to date have been inaccurate or unsafe.

INNOVATION

By leveraging the unique thin film properties of the cornea, Professor Taylor and colleagues have developed a technology which significantly improves the accuracy and sensitivity of corneal hydration sensing. This technology simultaneously detects the thickness and hydration levels of corneal tissue by using multiple-frequency measurements in the terahertz range. By combining spectroscopic measurement capability with novel imaging and scanning architectures, this methodology enables accurate measurement of CTWC gradients across the cornea.

APPLICATIONS

- ▶ Ophthalmology (measurement of hydration level of cornea)
- ▶ Detection of inflammation, immune responses, edema and other diseases in the cornea
- ▶ Thin film measurements

ADVANTAGES

- ▶ Accurate, quantitative measurement of corneal tissue hydration across the entire span of the cornea
- ▶ Does not rely on extrapolation from central corneal thickness to measure corneal tissue water content

RELATED MATERIALS

- ▶ [THz and mm-Wave sensing of corneal tissue water content: Electromagnetic modeling and analysis, Taylor et al. IEEE Transactions on Terahertz Science and Technology 2015](#)
- ▶ [THz and mm-Wave sensing of corneal tissue water content: in vivo sensing and imaging results, Taylor et al. IEEE Transactions on Terahertz Science and Technology 2015](#)

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,939,844	03/09/2021	2015-151

CONTACT

UCLA Technology Development Group
 ncd@tdg.ucla.edu
 tel: 310.794.0558.



INVENTORS

- ▶ Grundfest, Warren S.

OTHER INFORMATION

KEYWORDS

Corneal sensing and imaging, corneal hydration and thickness, terahertz illumination

CATEGORIZED AS

- ▶ [Imaging](#)
 - ▶ [Medical](#)
- ▶ [Medical](#)
 - ▶ [Devices](#)
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RELATED CASES

2015-151-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ [Scanning Method For Uniform, Normal-Incidence Imaging Of Spherical Surface With A Single Beam](#)
- ▶ [Assessment Of Wound Status And Tissue Viability Via Analysis Of Spatially Resolved Thz Reflectometry Maps](#)

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UCLA Technology Development Group

10889 Wilshire Blvd., Suite 920, Los Angeles, CA 90095

tdg.ucla.edu

Tel: 310.794.0558 | Fax: 310.794.0638 | ncd@tdg.ucla.edu

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