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Polarized Mueller Matrix Analytical Model for Glucose Measurement in Vitro

of

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**Abstract:** In this study we present a noninvasive and nonradioactive glucose in vitro measurement technique using the Mueller polarization analytical model. The glucose solution and aqueous humor phantoms are illuminated with a He-Ne (632.8 nm) laser. This in vitro study provides a base and reference data for in vivo eye glucose monitoring. The 16 Mueller polarization matrix element images give information about eye absorption and scattering, and changes in polarization patterns to measure glucose concentration. The interior part of the eye (aqueous humor) contains a birefringent scattering medium for glucose measurement. The Mueller matrix polarimetric technique for simultaneous extraction of rotating linear and circular polarized light is discussed theoretically and experimentally implemented. This method requires calculation of the Mueller matrix for different orientations of polarized light through turbid samples. The results are in good agreement with those in the literature.

**Key Words:** Polarization, glucose sensor, birefringence, depolarization, aqueous humor, Mueller matrix polarimeter

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