Non-Invasive Sensor for Determining Blood-Sugar Levels in Diabetics and Characterizing Materials

Depiction Of Layered Structure Of Skin And The Attenuation Of Incident Light On The Skin By Various Phenomena Such As Absorption And Scattering.

Integrated sensor characterizes optically dense materials by distinguishing the scattering and absorption coefficients of the materials from the incident light.

Non-invasive monitoring of various patients’ parameters, such as glucose concentrations, offers many advantages over invasive measurements. Patients could monitor themselves intermittently or continuously, without the need to painfully withdraw blood or perform complex chemical tests. Several electro-chemical methods determine blood glucose concentration, but all require collecting a small blood sample. Optical sensing methods do not require collecting biological samples, allowing them to operate as truly non-invasive techniques, but such methods undergo significant interferences hindering an accurate reading. In samples, such as blood, which contain one or more components with different refractive indices, it may be difficult to obtain useful information. Prior methods, such as infrared absorption spectroscopy, have failed to obtain an analyte’s (solvent, glucose or drug) concentration directly from its absorption spectrum within a sample due to strong scattering. Therefore, there is a need to develop a method in which the scattering influence is isolated from the absorption coefficients in a variety of materials.

Technical Details

The invention characterizes optically dense materials using an integrated optical sensor by independently determining the scattering and absorption coefficients for the materials. This novel sensor is based on low coherence interferometry and can be used as a non-invasive, fast, and inexpensive instrument for measuring the concentration of glucose in the skin. It can also be used to characterize tissues such as arteries and other organs during endoscopic procedures. Finally, it can be used for the characterization of complex composite materials in a variety of coating and material science applications.

Benefits

• Fast, non-invasive, real-time monitoring of blood glucose concentration
• Eliminates the pain and discomfort of finger-pricking
• Improves accuracy of the sensor while decreasing its manufacturing cost
• Minimizes the possibility of interference and scattering complications

Applications

• Non-invasive glucose sensor

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Inventors

Aristide Dogariu, Ph.D.