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Accession number:20114514495834
Title:Modeling of reflectometric and ellipsometric spectra from the skin in the terahertz and submillimeter waves region
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Source title:Journal of Biomedical Optics
Abbreviated source title:J Biomed Opt
Volume:16
Issue:6
Issue date:June 2011
Publication year:2011
Article number:067006
Language:English
ISSN:10833668
E-ISSN:15602281
CODEN:JBOPFO
Document type:Journal article (JA)
Publisher:SPIE, P.O. Box 10, Bellingham, WA 98227-0010, United States
Abstract:The human skin is modeled as a stack of homogeneous layers in the terahertz and submillimeter waves regions with some anisotropy due to the helical sweat glands and other elongated entities. A dielectric model for the skin is presented, valid for a wider frequency range (up to the terahertz region) taking into account the dispersive nature of the effective conductivity. Polarized reflectivity and generalized ellipsometric parameters are calculated versus angle and wavelength. Recent studies have claimed that the helical sweat ducts act as an array of low-Q helical antennae and are dominant in shaping the spectral response in the sub-terahertz region. We found that water absorption, dispersion and multiple interference effects play the major role in shaping the spectrum without the need for the assumption of the sweat ducts acting as low-Q helical antennae. High sensitivities to the water content are found particularly in the ellipsometric parameters at large incidence angles. Hence a new methodology is proposed to detect skin cancer using variable angle ellipsometry or polarized reflectometry. The parameter found with the highest sensitivity to water content is $\cos\Delta_{pp}$ with Δ_{pp} being the phase of the on-diagonal reflection matrix ratio between p-to-p polarization.
Number of references:58