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Year Month Day

学 位 (博 士) 論 文 要 旨
(Doctoral thesis abstract)

論文提出者 Ph. D. Candidate	生物システム応用科学府 <u>生物機能システム科学</u> 専攻 博士後期課程 <u>第2</u> グループ(Department Course) 平成 <u>28</u> 年度入学(Your Entrance Fiscal Year) 氏名 <u>牧野 健</u> (Your Name(Family, First) and Seal)				
主指導教員 氏 名 Chief Advisor's Name	西舘 泉	副指導教員 氏 名 Vice Advisor's Name		副指導教員 氏 名 Vice Advisor's Name	
論文題目 Title	Non-destructive observation of morphological and structural alterations in industrial materials based on near-infrared spectral-domain optical coherence tomography 近赤外スペクトル領域光コヒーレンストモグラフィーによる産業材料の形態・構造変化の非破壊観察				
<p>論文要旨 (和文要旨(2000 字程度)または英文要旨(500words)) ※欧文・和文どちらでもよい。但し、和文の場合は英訳を付すこと。 Write a summary in Japanese (2000 characters) or in English (500words). If the abstract is written in Japanese, needed to translate into English.</p> <p>This dissertation is concerned with near-infrared optical coherence tomography (OCT) in the spectral domain to visualize cross-sectionally structural and morphological alterations in industrial materials.</p> <p>The extinction coefficient of phantoms was measured by an OCT system with a 1362-nm near-infrared illuminating light. The Beer-Lambert law was introduced to the OCT measurement. It was obtained as a result that the sum of an absorption and a reduced scattering coefficients is optimal as the definition of the extinction coefficient measured by the OCT.</p> <p>The imaging and quantitative analysis of the natural evaporation for 90 minutes was conducted as the first stage. The dual near-infrared illuminating lights with the wavelengths of 1060 nm and 1470 nm were used in the OCT. The former is not absorbed by water the latter absorbed by a factor of 220. It is, therefore, expected that only the scattering by cellulose at the wavelength 1060 nm and both the scattering by cellulose and the absorption by water at 1470 nm are generated. Experimental results show that the scattering is generated by the temporal variation of the refractive-index matching effect between the hydrogen-bounded cellulose and free water around it. The phenomenon that the light at the wavelength 140 nm is not absorbed by water comes from the fact that the absorption cannot be accumulated due to the lack of space in the tissue where the free water is filled.</p> <p>The imaging and quantitative analysis of the evaporation process in/from tissues under forced heating was conducted as the second stage. The OCT with single near-infrared illumination of the wavelength 1470 nm was used to observe the fast phenomena for 30 seconds. The evaporation process can be stably visualized as the cross-sectional image and it is quantitatively shown that the water near the surface evaporates rapidly from the wet condition to dry one and keep the wet condition in deep region.</p> <p>The fast and high-definition spectral-domain OCT was newly developed as the application of a MicroLiDAR technique to the optical OCT. The light source, which is the new type of the OCT is based on the time-stretch dispersion Fourier transform. The spectral-domain OCT operation can be performed without the spectrometer on the time basis. In the experiment, the in-process measurement of a keyhole was experimentally studied to confirm the practicability of the time-stretch OCT.</p> <p>The research of this dissertation shows that the rapid process of water evaporation from the tissue can be successfully investigated by the cross-sectional image and the quantitative physical parameter by using the near-infrared OCT system in the spectral domain. The author concludes throughout the dissertation that the OCT can become a quite practical and useful tool to visualize and analyze</p>					

quantitatively the natural phenomena that nobody has ever been observed.

(英訳) ※和文要旨の場合 (300 words)

If the abstract is written in Japanese, needed to translate into English.(300 words)