function of six parameters of thickness of plate, extinction coefficients of plate and sample, thermal diffusivity of plate and sample, and ratio of thermal effusivity of plate and sample. We measured thermophysical properties of a sample that properties are given for validation of the method. We used a rigid polyvinyl chloride (PVC) sheet as thin plate and an epoxy resin as sample. The result shows the present technique is sufficiently accurate. The measurements were carried out for thermal effusivity and then thermal diffusivity of human skin.

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Cavity enhanced absorption spectroscopy and photoacoustic spectroscopy for human breath analysis

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The paper describes laboratory setups of two highly sensitive optoelectronic techniques: cavity enhanced absorption spectroscopy (CEAS) and photoacoustic spectroscopy (PAS). The setups are designed for investigation of exhaled volatile compounds. The analysis of the human breath is useful for health monitoring. The presence of certain gases (biomarkers) at unusual concentrations in human breath might indicate many serious diseases.

At present, the volatile biomarkers are analyzed using various chemical tools: mainly gas chromatography, mass spectrometry or the chemiluminescence. Rising interest of application of optoelectronic methods is observed recently. Here laser techniques are of great potential for detection and monitoring of the chemical components in gas phase. While the simple setups employing so-called direct laser absorption spectroscopy technique attain a detection limit up to 10^{-4} cm^{-1}, the CEAS sensors provide a detection limit of about 10^{-9} cm^{-1}. In this technique, an optical cavity of a high quality factor is applied. The cavity is built of two concave highly reflective mirrors. This results in a long optical path, reaching even up to a few kilometers [1]. Similar detection limit can be achieved by use of photoacoustic spectroscopy. PAS is based on the conversion of light to sound in absorbing materials. The photoacoustic signal is traditionally detected using a resonant acoustic cell equipped with a sensitive microphone. The sensitivity of PAS can be increased many times due to the use of resonance quartz forks (QTFs) [2]. Such technique is called quartz-enhanced photoacoustic spectroscopy (QEPAS). The QEPAS based sensor platforms are characterized by a non-complex design, immunity to environmental acoustic noise, applicability over a wide range of pressures, and the capability to analyze small gas samples, down to 1 mm^3 in volume.

Application of CEAS or PAS for biomarker monitoring provides opportunity to detect the pathogenic changes at molecular level. Because of non-invasive operation, easy use, the ability to re-use, real time measurement, minimum nuisance for patients, these sensors might be very useful tools for health monitoring.

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Dynamics of thermal denaturation of blood proteins: study with photothermal methods

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The photothermal techniques, in particular the photoacoustic spectroscopy, has been applied in analysis of biological systems such as permeation formulations in skin [1, 2], nail [3] and dentin [4], evidencing the importance of this technique for this area. Now, in this work, we applied photothermal methods, photoacoustic spectroscopies and thermal lens, allied to conventional techniques for employed to investigate the dynamics of thermal denaturation of blood proteins. The studies were performed in albumin, blood plasma and blood serum.

The results showed changes in the measured properties when the sample temperature was varied between 35 and 55 °C, which is the interval where proteins changes the conformational from native to denaturated phases. The combination of several methods allowed to perform an evaluation of the samples conformational changes, especially the decrease of the α-helix followed by the increase of the β-sheet structures, besides the formation of aggregates, detected in the absorbance data. The results, especially those obtained with the thermal lens technique showed, the occurrence of structural modifications that are difficult to detect via calorimetric methods, suggesting this technique as a new tool to study the conformational properties of proteins. In conclusion, this work showed through non-conventional methods the detection of the denaturation processes of blood proteins.

Finally, it was demonstrated, that the thermal lens and the photoacoust spectroscopy are new tools to study proteins denaturation processes, indicating that the adopted procedure can be used to investigate other animal and vegetal proteins, in order to correlate their thermal stability behavior with the conformational structures.

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