Poster

OPTOACOUSTIC SPECTROSCOPY OF SPHERICAL GOLD NANOPARTICLE CONTRAST AGENTS IN A SCATTERING MEDIA

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The optoacoustics technique is proving to be a formidable player in research for the detection and monitoring of abnormalities in the human body. This method is based on the thermal excitation of acoustic waves from absorbed short pulsed laser energy. The temporal and amplitude characteristics of the acoustic signals produced indicate the amount of laser energy absorbed by the media [1]. Using these characteristics the optoacoustic technique can be employed for non-invasive real time biomedical imaging of soft tissue [2][3]. To enhance the contrast levels between healthy and un-healthy tissue, non-toxic contrast agents composed of spherical gold nanoparticles are used to increase the absorption efficiency. Recent work using the optoacoustic technique is based on optoacoustic spectroscopy (OAS). Using this approach important physiological information as regards the constitution of the biological matter is given by the light absorption properties.

OAS is carried out by irradiating the area of interest with a short pulsed tunable laser source, a study of the resulting acoustic signal characteristics for different emission wavelengths defines the amount of optical radiation absorbed for each wavelength. R.O. Esenaliev *et al* have studied the feasibility of using this technique to investigate cerebral venous oxygenation levels [4]. J. Sundararajan *et al* have implemented a similar system to quantify the blood glucose levels for diabetic patients [5]. There are many inherent advantages when using OAS, these are increased spatial resolution and spectroscopic information of deeply embedded media. Standard spectroscopic techniques are limited by the penetration depth, where detection of the attenuated light is hampered by the scattering of healthy soft tissue. In OAS the attenuation of the acoustic signals after absorption is minimal. Another advantage to this technique is that the acoustic signals produced are independent of the scattering and provide information on the absorbed light only.

In this paper we present the OAS characterization of spherical gold nanoparticles using a tunable optical parametric oscillator (OPO) laser pumped with a Nd:YAG laser. We will investigate the relation between the amplitude of the acoustic signal generated from optoacoustic excitation and the absorption for different wavelengths of the spherical gold particles in a scattering media. These results will be compared to spectroscopic results obtained using classical light transmission techniques.

References:

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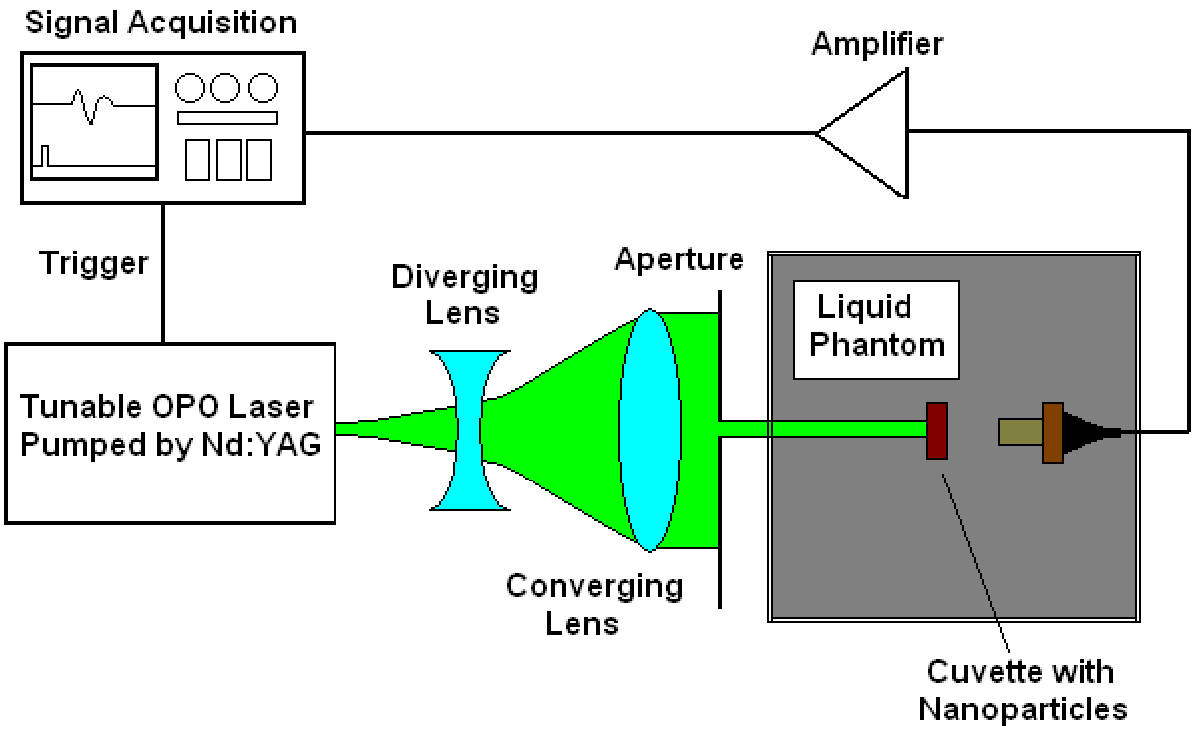
Figures:



Optoacoustic Spectroscopy measurement scheme composed using tunable Nd:YAG laser for gold nanoparticle characterization in a liquid phantom representing human soft tissue