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Experimental Studies on Optical Properties of Human Blood Using Different Materials of Seeding Particles for Laser Doppler Velocimetry

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Abstract

Blood supply is necessary for the proper functioning of all body organs as blood carries all the nutrients and oxygen that our body needs to stay healthy. Various diseases cause an impaired supply of blood to the organs. The measurement of the blood flow can therefore provide essential information for the diagnosis of diseases like Atherosclerosis. Since changes in blood flow occurs with early stage of disease detection, with a fast, reliable and non-invasive blood flow measurement technique called Laser Doppler Velocimetry (LDV).

Knowledge about the micro-optical parameters of human blood i.e. absorption coefficient μ_a , scattering coefficient μ_s , anisotropy factor g , and their dependence on physiological parameters such as haematocrit, oxygen saturation, osmolarity and haemolysis plays an important role in many diagnostic and therapeutic applications of laser in medicine.

Experimental studies on scattering coefficients for human blood of 133.264 seeded with silver particles,

70.421 seeded with aluminium powder, 19.852 seeded with barium-ferrite powder, 48.88 seeded with titanium dioxide powder and 17.641 seeded with magnesium powder using blue laser operating at peak wavelength of 457 nm were investigated.

To optimize the measurement on optical properties of human blood, the choice of seeding particles materials and size are the most important parameters to achieve the successful results of LDV. Seeding particles should be small enough to follow the flow being measured, but large enough to generate a strong scattering signal. Standard particle sizes range from 1 micron to 12 microns.