Proceedings of CHT-15
ICHMT International Symposium on Advances in Computational Heat Transfer

May 25-29, 2015, Rutgers University, Piscataway, USA

CHT-15-047

NUMERICAL INVESTIGATION OF THERMAL RESPONSE OF BIOLOGICAL TISSUES BASED ON THE DUAL-PHASE- LAG BIO-HEAT TRANSFER MODEL DURING LASER-BASED PHOTO-THERMAL THERAPY

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ABSTRACT

The present work is concerned with the development and application of dual phase lag based heat conduction model for investigating the thermal response of laser-irradiated biological tissue phantoms. The developed heat transfer model has been coupled with the radiative transport equation that describe the phenomena of light propagation inside the tissue phantom. The radiative transport equation has been solved using the discrete ordinate method to determine the 2-D distribution of light intensity within the tissue phantom, while finite volume method based discretization has been employed for solving the heat transfer model. The developed numerical model has been validated against the results available in the literature. The results obtained in the form of temperature distribution through the dual phase lag model have been compared with conventional Fourier heat conduction model as well as with hyperbolic heat conduction model. Thereafter, the effect of two phase lags terms i.e. τ_T and τ_q associated with dual phase lag model on the resultant thermal profiles within the body of the two-dimensional tissue phantom have been investigated.